

Kansas Army Ammunition Plant
Parsons
Labette County
Kansas

HAER No. KS-4

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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, DC 20013-7127

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HISTORIC AMERICAN ENGINEERING RECORD

Kansas Army Ammunition Plant

KS-4

Location: South of US Route 160 in Parsons, Labette County, Kansas.

Date of Construction: Established in 1941, most of the buildings were constructed during WWI.

Owner: Department of the Army

Significance: Kansas Army Ammunition Plant was one of several Army ammunition plants constructed during WWII, and the majority of its buildings and structures are used for Storage and production purposes. Maintaining a high level of integrity, Kansas Army Ammunition Plant possesses limited significance as a good example of a WWII-era military production and storage facility.

Historical Report
Prepared by: Libby Baylies Burns and Julie Mueller, 1982.

Prepared for
Transmittal by: Robie S. Lange, HABS/HAER, 1985.

EXECUTIVE SUMMARY

Kansas Army Ammunition Plant is a government-owned, contractor-operated munitions manufacturing and storage facility located on 13,727 acres at Parsons, Kansas. One of several Army ammunition facilities constructed during World War II, the plant largely maintains its World War II layout and landscape. The majority of the 562 buildings are storage facilities. The remainder are production and production-related support structures. Activity at Kansas has reflected the greater political and military environment with heightened activity during the Cold War, Korean War and Vietnam War, and deactivation and lay-aways of many areas during periods of relative stability.

Although the Kansas Army Ammunition Plant as a whole possesses limited historical significance as a typical World War II-era facility its individual buildings do not possess any specific historical, architectural or industrial significance at this time. There are no Category I, II or III properties at this installation.

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PREFACE

This report represents the results of an historic properties survey of Kansas Army Ammunition Plant. Prepared for the United States Army Materiel Development and Readiness Command (DARCOM), the report is intended to assist the Army in bringing this installation into compliance with the National Historic Preservation Act of 1966 and its amendments, and related federal laws and regulations. To this end, the report focuses on the identification, evaluation, documentation, nomination, and preservation of historic properties at Kansas. Chapter 1 sets forth the survey's scope and methodology; Chapter 2 presents an architectural, historical, and technological overview of the installation and its properties; and Chapter 3 identifies significant properties by Army category and sets forth preservation recommendations. Illustrations and an annotated bibliography supplement the text.

This report is part of a program initiated through a memorandum of agreement between the National Park Service, Department of the Interior, and the U.S. Department of the Army. The program covers 74 DARCOM installations and has two components: 1) a survey of historic properties (districts, buildings, structures, and objects), and 2) the development of archeological overviews. Stanley H. Fried, Chief, Real Estate Branch of Headquarters DARCOM, directed the program for the Army, and Dr. Robert J. Kapsch, Chief of the Historic American Buildings Survey/Historic American Engineering Record (HAES/HAER) directed the program for the National Park Service. Sally Kress Tompkins was program manager, and Robie S. Lange was project manager for the historic properties survey.

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This report was one of five pilot studies undertaken by the HABS/HAER office in the summer of 1982. For the purpose of testing and tapering HABS/HAER survey methodology to the specific requirements of the DARCOM project summer field teams, under the direction of HABS/HAER staff members, were sent to five DARCOM installations. Libby Baylies Burns, field supervisor, and Julie Mueller did the field work at Kansas and prepared this report. The authors greatly acknowledge the help of Ron Keenan, Chief Engineer.

The complete HABS/HAER documentation for this installation will be included in the HABS/HAER collections at the Library of Congress, Prints and Photographs Division, under the designation, HAER # KS-4.

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Chapter 1

INTRODUCTION

SCOPE

This report is based on an historic properties survey conducted in 1982 of all Army-owned properties located within the official boundaries of Kansas Army Ammunition Plant. The survey included the following tasks:

- o Completion of documentary research on the history of the installation and its properties.
- o Completion of a field inventory of all properties at the installation.
- o Preparation of a combined architectural, historical, and technological overview for the installation.
- o Evaluation of historic properties and development of recommendations for preservation of these properties.

Also completed as a part of the historic properties survey of the installation, but not included in this report, are HABS/HAER Inventory cards for 134 individual properties. These cards, which constitute HABS/HAER Documentation Level IV, will be provided to the Department of the Army.

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Archival copies of the cards, with their accompanying photographic negatives, will be transmitted to the HABS/HAER collections at the Library of Congress.

The methodology used to complete these tasks is described in the following section of this report.

METHODOLOGY

1. Documentary Research

Kansas Army Ammunition Plant was one of several Army ammunition plants constructed during World War II, and the majority of its buildings and structures are used for storage and production purposes. Documentary research centered on the developmental history of the installation and its role as an Army munitions facility. The Kansas State Historic Preservation Office was contacted about possible historic properties at Letterkenny, but no historic properties were identified by this source.

Army records used for the field inventory included current Real Property Inventory (RPI) printouts that listed all officially recorded buildings and structures by facility classification and date of construction; the installation's property record cards; base maps and photographs supplied by installation personnel; installation master planning, archeological, environment assessment, and related reports and documents. A complete listing of documentary material may be found in the bibliography.

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2. Field Inventory

The field inventory was conducted by Libby Baylies Burns and Julie Mueller in mid-August of 1982. Assistance was provided by Mr. Ron Keenan of the Facilities Engineering Office at Kansas.

Field inventory procedures were based on the HABS/HAER Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures.¹ All areas and properties were visually surveyed. Building locations and approximate dates of construction were noted from the installation's property records and field-verified.

Field inventory forms were prepared for, and black and white 35mm photographs taken of all buildings and structures through 1945 except basic utilitarian structures of no architectural, historical, or technological interest. When groups of similar ("prototypical") buildings were found, one field form was normally prepared to represent all buildings of that type. Field inventory forms were also completed for representative post-1945 buildings and structures.² Information collected on the field forms was later evaluated, condensed, and transferred to HABS/HAER Inventory cards.

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3. Historic Overview

A combined architectural, historical, and technological overview was prepared from information developed from the documentary research and the field inventory. It was written in two parts: 1) a introductory description of the installation, and 2) a history of the installation by periods of development, beginning with pre-military land uses. Maps and photographs were selected to supplement the text as appropriate.

The objectives of the overview were to 1) establish the periods of major construction at the installation, 2) identify important events and individuals associated with specific historic properties, 3) describe patterns and locations of historic property types, and 4) analyze specific building and industrial technologies employed at the installation.

4. Property Evaluation and Preservation Measures

Based on information developed in the historical overviews, properties were first evaluated for historical significance in accordance with the eligibility criteria for nomination to the National Register of Historic Places. These criteria require that eligible properties possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that they meet one or more of the following.³

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- A. Are associated with events that have made a significant contribution to the broad patterns of our history.
- B. Are associated with the lives of persons significant in the Nation's past.
- C. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.
- D. Have yielded, or may be likely to yield, information important in pre-history or history.

Properties thus evaluated were further assessed for placement in one of five Army historic property categories as described in Army Regulation 420-40:⁴

Category I	Properties of major importance
Category II	Properties of importance
Category III	Properties of minor importance
Category IV	Properties of little or no importance
Category V	Properties detrimental to the significance of adjacent historic properties

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Based on an extensive review of the architectural, historical, and technological resources identified on DARCOM installations nationwide, four criteria were developed to help determine the appropriate categorization level for each Army property. These criteria were used to assess the importance not only of properties of traditional historical interest, but of the vast number of standardized or prototypical buildings, structures, and production processes that were built and put into service during World War II, as well as of properties associated with many post-war technological achievements. The four criteria were often used in combination and are as follows:

- 1) Degree of importance as a work of architectural, engineering, or industrial design. This criterion took into account the qualitative factors by which design is normally judged: artistic merit, workmanship, appropriate use of materials, and functionality.
- 2) Degree of rarity as a remaining example of a once widely used architectural, engineering, or industrial design or process. This criterion was applied primarily to the many standardized or prototypical DARCOM buildings, structures, or industrial processes. The more widespread or influential the design or process, the greater the importance of the remaining examples of the design or process was considered to be. This criterion was also used for non-military structures such as farmhouses and other once prevalent building types.

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- 3) Degree of integrity or completeness. This criterion compared the current condition, appearance, and function of a building, structure, architectural assemblage, or industrial process to its original or most historically important condition, appearance, and function. Those properties that were highly intact were generally considered of greater importance than those that were not.

- 4) Degree of association with an important person, program, or event. This criterion was used to examine the relationship of a property to a famous personage, wartime project, or similar factor that lent the property special importance.

The majority of DARCOM properties were built just prior to or during World War II, and special attention was given to their evaluation. Those that still remain do not often possess individual importance, but collectively they represent the remnants of a vast construction undertaking whose architectural, historical, and technological importance needed to be assessed before their numbers diminished further. This assessment centered on an extensive review of the military construction of the 1940-1945 period, and its contribution to the history of World War II and the post-war Army landscape.

Because technology has advanced so rapidly since the war, post-World War II properties were also given attention. These properties were evaluated in terms of the Nation's more recent accomplishments in weaponry, rocketry, electronics, and related technological and scientific

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endeavors. Thus the traditional definition of "historic" as a property 50 or more years old was not germane in the assessment of either World War II or post-war DARCOM buildings and structures; rather, the historic importance of all properties was evaluated as completely as possible regardless of age.

Property designations by category are expected to be useful for approximately ten years, after which all categorizations should be reviewed and updated.

Following this categorization procedure, Category I, II, and III historic properties were analyzed in terms of:

- o Current structural condition and state of repair. This information was taken from the field inventory forms and photographs, and was often supplemented by rechecking with facilities engineering personnel.
- o The nature of possible future adverse impacts to the property. This information was gathered from the installation's master planning documents and rechecked with facilities engineering personnel.

Based on the above considerations, the general preservation recommendations presented in Chapter 3 for Category I, II, and III historic properties were developed. Special preservation recommendations were created for individual properties as circumstances required.

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5. Report Review

Prior to being completed in final form, this report was subjected to an in-house review. It was then sent in draft to the subject installation for comment and clearance. When the installation cleared the report, additional draft copies were sent to DARCOM, the appropriate State Historic Preservation Officer, and, when requested, to the archeological contractor performing parallel work at the installation. The report was revised based on all comments collected, then published in final form.

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NOTES

1. Historic American Buildings Survey/Historic American Engineering Record, National Park Service, Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures (unpublished draft, 1982).
2. Representative post-World War II buildings and structures were defined as properties that were: (a) "representative" by virtue of construction type, architectural type, function, or a combination of these, (b) of obvious Category I, II, or III historic importance, or (c) prominent on the installation by virtue of size, location, or other distinctive feature.
3. National Park Service, How to Complete National Register Forms (Washington, D.C.: U.S. Government Printing Office, January 1977).
4. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).

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Chapter 2

HISTORICAL OVERVIEW

Background

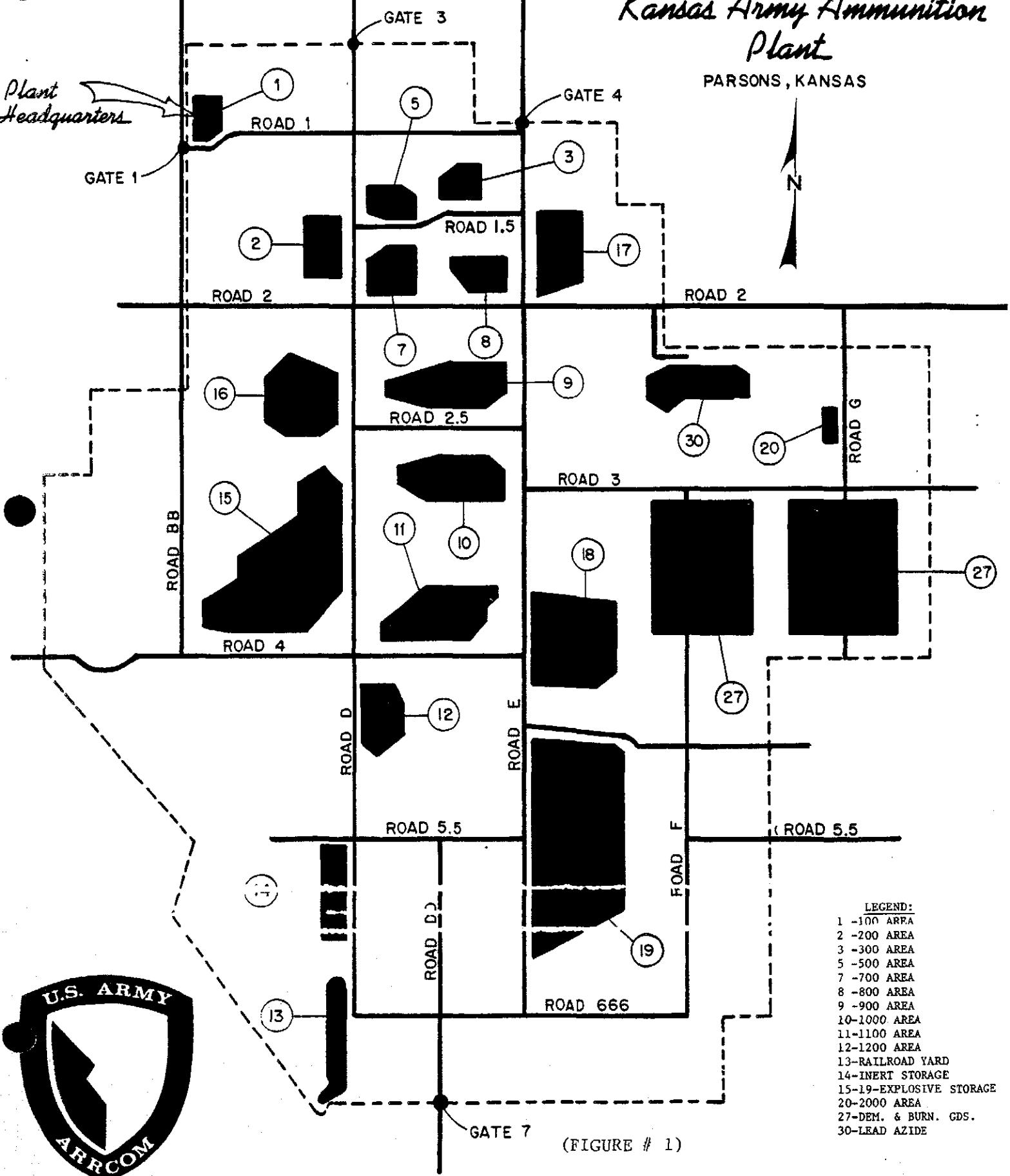
The Kansas Army Ammunition Plant (KAAP) is one of several installations built by the Army during World War II for the production and storage of materiel. Owned by DARCOM, the installation consists of 562 buildings located on 13,727 acres in Labette County, Kansas. The history of KAAP's mission and production cycles reflect the course of political and military events over the past half century. During times of political crisis and military action, the plant required increase production and employment. Additionally, advances in armament technology required the adaptation and up-dating of lines to accept new machinery and processes. In contrast, times of peace decreased production demands resulting in plant shutdowns and the lay-away of many areas. In spite of these fluctuations in the rate of occupancy and the type of industrial process employed, KAAP remains virtually intact as a record of a World War II army ammunition plant. The site design and the industrial buildings' exteriors remain unaltered in almost all instances. (Figure #1) Minor alterations made to some buildings have not affected the integrity of the World War II image. Except for the demolition of the staff housing area in the early 1950's, only a handful of the buildings at the site have been lost. The present appearance is due, in part, to the plant's continued use as an ammunition plant and to the fact that many lines have been in a state of lay-away for most of their existence.¹

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PARSONS, KANSAS

Plant Headquarters



- LEGEND:**
- 1 -100 AREA
 - 2 -200 AREA
 - 3 -300 AREA
 - 5 -500 AREA
 - 7 -700 AREA
 - 8 -800 AREA
 - 9 -900 AREA
 - 10-1000 AREA
 - 11-1100 AREA
 - 12-1200 AREA
 - 13-RAILROAD YARD
 - 14-INERT STORAGE
 - 15-19-EXPLOSIVE STORAGE
 - 20-2000 AREA
 - 27-DEM. & BURN. GDS.
 - 30-LEAD AZIDE

(FIGURE # 1)

Site Selection

The history of the construction of the Kansas Army Ammunition Plant illustrates the type of activity necessitated by the impending war and the need for increased national defense and military aid during the early 1940's. The choice of site and rapid erection of the plant is a single example of the War Department's response to these events. As one of the ammunition plants constructed during this period, the study of KAAP provides a rich source of information on the type of industrial military buildings erected during World War II and the design of a site plan, as well as the type of location, preferred to suit the needs of an ammunition plant.

In May of 1939, the Secretary of War authorized appropriations for the construction of the Kansas Ordnance Plant (later to become the Kansas Army Ammunition Plant). Within the following two years, the United States government purchased thousands of contiguous acres of rolling prairie farmland from the farmers of Parsons, Kansas. The large, flat, open expanse provided an ideal site for an ammunition plant, whose function required the separation of both buildings and different production lines by large distances to prevent chain explosions. Black and Veatch, consulting engineers of Kansas City under contract to the Quartermaster Corps, surveyed the land. Houses, barns, schools and churches located on the acquired property were either moved by their former owners or were demolished by the Army. Two cemeteries, the

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Franklin and the Fairview, located within the boundaries of the plant, are the only remaining, clearly visible evidence of the site's pre-military history. They served the local community from 1871 to 1941 (see appendix 2).

World War II Construction

Construction of KAAP was rapid. Begun in 1941, work was completed in only one year. The Corps of Engineers contracted the architects, Battey and Childs. Construction contractors were Peter Kiewit Sons Co. and George W. Condon Co. of Omaha and Paschen Contractor, Inc. of Chicago.² Eight load, assemble and pack lines (LAP) for the loading, assembly and packing of 81mm shells and 100 pound bombs and facilities for the production of fuzes, boosters, detonators and primers for the above ammunition were completed by November 1942. Administration, maintenance and support areas were also erected, along with miles of fence and new roads.

To accomplish this significant construction task in such a brief period, building designs and their components were standardized. Standard specifications were employed for masonry, carpenter's work and roofing to name a few. Hardware, sash and doors were also standardized. In addition, similar building materials were utilized throughout the plant -- concrete slab foundations, asbestos shingle roofing, hollow clay tile walls for industrial buildings and novelty wood siding for support facilities. Since steel was at a premium during this period, wood 2 x 4's were bolted together to form trusses. The standard truss width, 51'5", in turn standardized the width of

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the buildings in which it was employed. In addition, prefabricated sections of walls, doors and roofs were brought to the construction area allowing a building time of three days.³ Storage facilities such as igloos and warehouses were built from designs known to have been used at other installations during this period. Within the KAAP plan, several buildings of identical design were constructed in the production and administration areas as well, for example, change houses, boiler plants, vacuum houses and sentry stations.

A standardization of architectural design and features created many structural types among KAAP's buildings. A structural type is defined as a building type which has basically one design but may house a variety of functions causing slight architectural variations. The production or LAP buildings at KAAP illustrate this point.

Generally long and narrow with gable roofs, LAP buildings are built of structural clay tile with doors and windows at regular intervals.

Architectural variations of the LAP buildings are related to their function. The load and assemble areas within these buildings are often divided by concrete partition walls which protrude through the roof to prevent the spread of fire or explosion. (Figure #2) For those buildings used as packing houses, loading platforms and sliding doors replace the standard double doors found in the load and assemble areas. Like their exterior design, LAP buildings have four standard interior arrangements: 1) buildings with no partition walls, 2) buildings with a single partition wall at one end of the building, 3) buildings with concrete partition walls at regular intervals

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Detonator Loading Building #715. Located in the 700 area this building is one of many similar ones with concrete partition walls utilized to prevent the spread of fire or explosions. (HABS/HAER Field Photograph #6:31A)

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which protrude through the roof, and 4) those with partitions which do not protrude through the roof. In addition to the very long, narrow LAP buildings, a few smaller buildings serving the same functions are located the 700 and 800 areas. These buildings have thick concrete partition walls which protrude above the roof and are meant to isolate and direct an explosion.

The similar arrangement of buildings within each area adds to the architectural cohesiveness of the entire plant. Areas having explosives-related production lines have similar site plans. The highly explosive nature of the materials used at these sites demanded a series of small buildings (64 to 120 square feet) set at large distances from one another and from the larger LAP facilities, for the unloading and storage of explosive powders prior to their processing. In addition, all buildings are connected to one another by a network of enclosed walkways to protect employees, materials and products from the elements. These walkways wrap around most buildings like enclosed porches.

In sum, the Kansas Army Ammunition Plant's cohesive visual image and historic landscape are characterized by standardized building designs, structural types, and a sprawling functional site plan. KAAP is not exceptionally unusual or unique among army installations of its period in its architectural integrity. As a well-preserved World War II army ammunition plant, the buildings and site are of limited historical value as an example of the United States Department of War's response to the materiel needs of World War II.

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KAAP's Mission

The industrial mission of KAAP has traditionally been one of production and storage. Research and development have not played a role in the history of the installation. The main responsibilities of KAAP have been:

- to load, assemble and pack items of ammunition
- to operate and maintain active facilities
- to maintain laid-away and stand-by facilities
- to participate in industrial preparedness and emergency mobilization planning
- to manufacture explosives, and to load, assemble and pack ammunition and explosive loaded ammunition components and related products⁴

The mission has basically remained unchanged since the plant was first planned. The Johns Manville Corporation ran KAAP for its first three years during the Second World War, employing over 7000 people. It was common practice then, as it is today to contract the operation of an installation to a private company. This is known as a GOCO (Government-Owned, Contractor-Operated) operation. During the war, the Ordnance Department, the branch of the War Department responsible for the production of ammunition, had 300 personnel on site working in conjunction with the contractor.

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From 1945 to 1950, all production activities ceased and the government maintained the plant on a stand-by basis without a contractor. The installation was run solely by the government, making it a GOGO (Government-Owned, Government-Operated) plant. The post-war years were spent receiving, storing and issuing ammunition and maintaining the facility. In 1945 all available land was leased to local farmers for agricultural purposes, a practice which has continued to the present day.

The Cold War and the Korean Conflict precipitated reactivation of the plant by the Ordnance Corps in the early 1950's. The actual rehabilitation of the plant was carried out by the Corps of Engineers. KAAP was running at full capacity by 1954 and continued to do so until 1957 when it went into a ten year stand-by period.

The war in Southeast Asia catapulted the plant into full action once again for four years beginning in 1967.

Lay-away of the various lines began in 1970 under the present contractor, Day and Zimmermann, but was not completed until the late 1970's. Presently, two lines are manufacturing ammunition and a third is undergoing rehabilitation for use in the future. A discussion of these industrial lines follows.

1. Industrial Lines

The plant is divided geographically into twenty-one areas, each area having a separate function. Nine of the areas have lines which are reserved for

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production related activities. With the exception of the lead azide line (3000), all production lines were erected during the Second World War.

a. THE 300 LINE - FUZE LOADING

The 300 area was used as a fuze loading line during World War II. In the 1960's the line manufactured explosives for mines. The line was modified in 1976 to load, assemble and pack the projectile, 155mm Improved Conventional Munitions round (ICM). The 300 line continues this production today.

b. THE 500 LINE - BOOSTER LINE

The 500 area originally produced supplementary charges and boosters (M21A4). The Line was reactivated to perform the same task in 1951 until being laid away in 1957. In 1967 the plant was modified to load, assemble and pack the XM 716 and 717 fuzes. Production of these items ceased in 1969 and the plant was laid away in 1971. Future plans call for its use in ICM production.

c. THE 700 LINE - DETONATOR LOADING

The 700 area is the largest, currently active line. Originally designed to manufacture detonators, it continues to produce detonators as well as explosion charges.

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d. THE 800 LINE - PRIMER LOADING

The 800 area has always been used for the production of primers. Its active history follows that of the entire plant: activated during times of war and laid away during times of peace. It is presently in a medium state of readiness lay-away.

e. THE 900 LINE - 105mm SHELL LOADING

The 900 area produced 105mm howitzer ammunition during World War II and the Korean Conflict. From 1968 to 1972 it produced 81mm mortar rounds. For the next four years the line was modernized and automated to produce, on a trial run, the M374A3 mortar cartridge. Since 1978, the 900 area has been laid away to a medium state of production readiness.

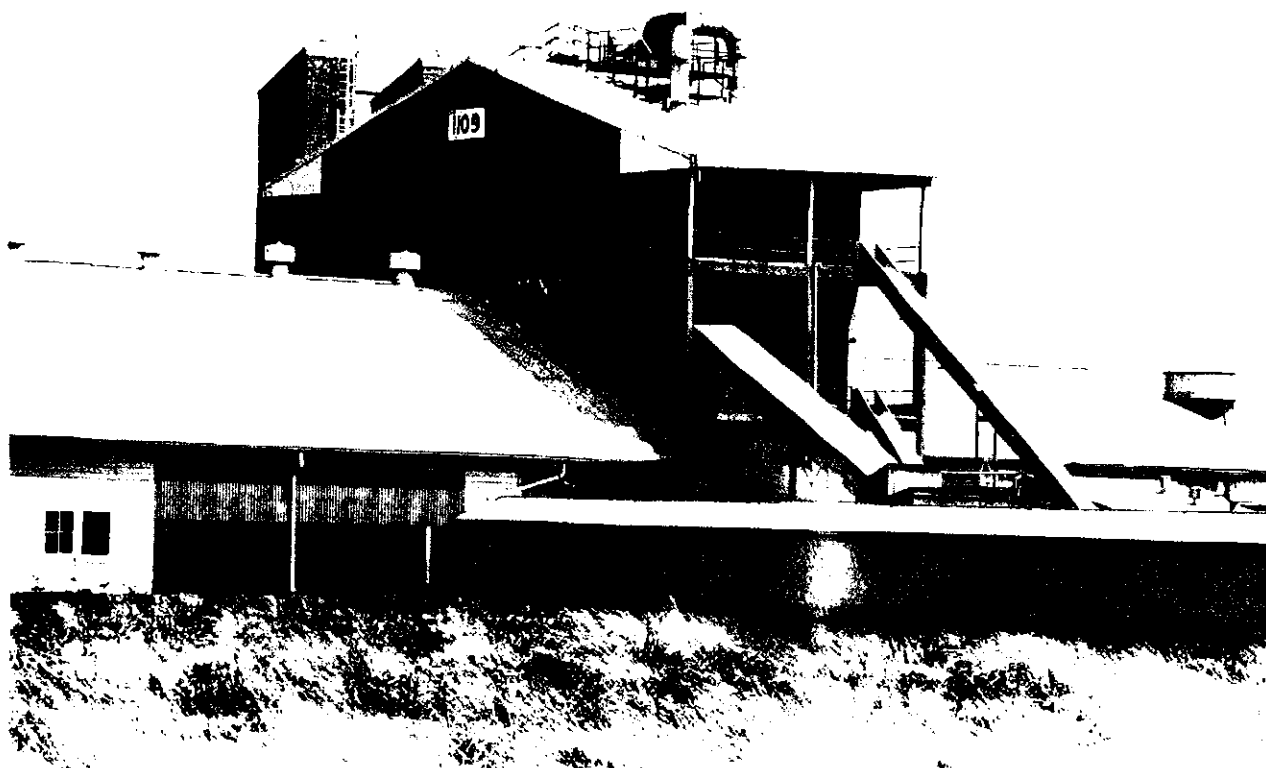
f. THE 1000 LINE - MELT LOADING

Like the 700 line, the 1000 line has been used throughout its history for its original function, producing 105mm ammunition. In 1968, the line was reactivated, modernized, and partially automated. Ten years later, the line was laid away.

g. THE 1100 LINE - DEMOLITION BOMB LOADING

Of all the original production lines, the 1100 line has undergone the most physical change. (Figure #3) Originally used for the production of bombs during times of war, the area is presently being prepared for the production

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Melt and Pouring Building #1109. Located in the 1100 area this building features emergency safety shutes from the second and third floor levels. (HABS/HAER Field Photograph #2:8)

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of Combined Effects Munitions (CEM) for the Air Force. As a result, several buildings are being demolished. Limited production is expected to begin this year.

h. THE 1200 LINE - AMMONIUM NITRATE PLANT

The 1200 area is the smallest of the production lines. Presently in a laid-away state, it was first designed as an ammonium nitrate production plant. During the Korean Conflict, the area was used as a plant to rework 105mm cases returned from overseas.

i. THE 3000 LINE - LEAD AZIDE PLANT

The newest production area is the 3000 area designed by DuPont de Nemours was constructed by Martin K. Eby Construction Co. under contract with the U.S. Army Corps of Engineers in 1948. The plant was designed to produce lead azide and sodium azide. Except for a trial run of the lead azide facility, the plant has never been used.

2. Storage

The Kansas Army Ammunition Plant stores finished ammunition until shipment and stores explosives and inert parts until consumed in production. There are two types of storage facilities on site.

- a. Igloos are found in areas 1500 (explosives storage), 1600 (bulk powder), 1700 and 1900 (explosives and finished ammunition), and 2700.

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- b. Warehouses are in areas 1400 (inert storage) and 1800 (finished ammunition).

The structures were used through the Korean Conflict. After that time the government retained a certain number of the buildings for its continued use and leased the unused buildings to private companies for storage purposes. At present, most of the igloos and warehouses are empty. These structures have not been altered since their construction. They represent an intact example of not only a World War II storage building type, but also a complete site plan since none have been demolished.

Notes

1. When the industrial buildings at KAAP are not in use for an extended period of time, i.e. when a production line is shut down, the buildings are put in a state of "lay away." Buildings are decontaminated with thorough chemical washing to rid them of explosive materials, such as powders. They are then locked up. However, windows and doors are not covered over. Machinery is disassembled, washed, greased and either stored within the building or elsewhere.

An alternative to the laying away of buildings is a state of "stand by." In this instance, buildings and machinery have been decontaminated but the machinery is assembled and ready to begin production upon short notice.

2. "DARCOM Installation and Activity Brochure for the Kansas Army Ammunition Plant, (Reports Control Symbol DRCLIS-102)." The name George W. Condon is listed as George W. Crandon in the "Kansas Army Ammunition Plant, Parsons, Kansas" publication by Day and Zimmermann.
3. "Kansas Ordnance Report Parsons, Kansas Consoer, Townsend and Quinlan; and Battey and Childs Architect-Engineer Organization Procedures," Historic Records Box 34, KAAP, unpublished report; THE KAAPSULE, October 1971.
4. "DARCOM Installation and Activity Brochure for the Kansas Army Ammunition Plant, (Reports Control Symbol DRCLIS-102)."
5. Bi-Annual Historical Reports for the Kansas Army Ammunition Plant, July 1951 to December 1957, unpublished reports. "Annual Historical Summary (RCS CSHIS - 6(R2)), KAAP, July 1970 to June 1973, typescript. "DARCOM Installation and Activity Brochure for the Kansas Army Ammunition Plant, (Report Control Symbol DRCIS-102)."

Chapter 3

PRESERVATION RECOMMENDATIONS

Background

The Army Regulation on Historic Preservation requires that an historic preservation plan be developed as an integral part of each installation's planning and long-range maintenance and development scheduling. The purpose of such a program is to:

- * Preserve historic properties to reflect the Army's role in history and its continuing concern for the protection of the nation's patrimony.
- * Implement historic preservation projects as an integral part of the installation's maintenance and construction programs.
- * Find adaptive uses for historic properties in order to maintain them as actively used facilities on the installation.
- * Eliminate damage or destruction due to improper maintenance, repair, or use that may alter or destroy the significant elements of any property.
- * Enhance the most historically significant areas of the installation through appropriate landscaping and conservation.

To meet these overall preservation objectives, the following general preservation recommendations apply:

Category I Properties

All Category I properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for nomination, and as such are subject to the "Procedures for the Protection of Historic and

Cultural Properties" (36 CFR 800) of the Advisory Council for Historic Preservation (ACHP). The following general preservation recommendations apply to these properties:

- a) Each Category I property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category I properties should not be altered or demolished without ACHP review, as specified in the above referenced procedures.
- b) An historic preservation plan should be developed and put into effect for each Category I property. This plan should delineate the appropriate maintenance and conservation, rehabilitation, or restoration program to be carried out for that property. It should include a maintenance and repair schedule and estimated initial and annual costs. The plan should be approved by the State Historic Preservation Officer in accordance with the above referenced ACHP procedures. Until the historic preservation plan is put into effect, Category I properties should be maintained in accordance with the Secretary of the Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings.¹
- c) Each Category I property should be documented in accordance with HABS/HAER Documentation Level II, and submitted for inclusion in the HABS/HAER collections in the Library of Congress.² When no adequate architectural drawings exist for a Category I property, it shall be documented in accordance with Documentation Level I of these

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standards. In addition to Documentation Level I, in cases where standard measured drawings are unable to record the significant features of a property or technological process, interpretive drawings should be prepared.

Category II Properties

- 1) Category II properties currently listed on or eligible for nomination to the National Register should conform to the general preservation recommendations that apply to Category I.
- 2) Category II properties not individually eligible for nomination to the National Register should conform to the following general preservation recommendations:
 - a) Category II properties should not be demolished, and their facades, or other elements of the property that are significant, should be protected from major or irreversible modifications.
 - b) An historic preservation plan shall be developed for each Category II property, similar to the requirements for Category I.
 - c) Each Category II property shall be documented in accordance with HABS/HAER Documentation Level II and submitted for inclusion in the HABS/HAER collections in the Library of Congress.³

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Category III Properties

- 1) No special maintenance of Category III properties is required if they are not listed on or eligible for nomination to the National Register as part of a district or thematic group. Such properties, however, should not be demolished, and their facades or those parts of the property that contribute to the historical landscape or visual value of the district or group, should be protected from major modifications. HABS/HAER Documentation Level IV has been completed for these properties, and no additional documentation is required.
- 2) Category III properties listed on or eligible for nomination to the National Register as part of a district or thematic group should conform to the following general preservation recommendations:
 - a) Properties should be treated as if they are on the National Register, whether listed or not. Properties not currently listed should be nominated. Such properties may not be altered or demolished without ACHP review, as specified for Category I properties.
 - b) An exterior maintenance plan should be developed for all properties in each such district or group.
 - c) Properties that are endangered for operational or other reasons should be documented in accordance with HABS/HAER Documentation Level

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III, and submitted for inclusion in the HABS/HAER collections in the Library of Congress.⁴ Similar structures need only be documented once.

Category I Properties

There are no Category I properties at KAAP.

Category II Properties

There are no Category II properties at KAAP.

Category III Properties

There are no Category III properties at KAAP.

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Notes

1. National Park Service, Secretary of the Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings, 1983 (Washington, D.C.: U.S. Government Printing Office, 1983).
2. Historic American Buildings Survey/Historic American Engineering Record, National Park Service, Annotated Standards for Structural Documentation (Washington, D.C.: HABS/HAER, May 1983).
3. Annotated Standards.
4. Annotated Standards.

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BIBLIOGRAPHY

A. SOURCES AT DARCOM HEADQUARTERS, ALEXANDRIA, VIRGINIA

1. Unpublished Reports

DARCOM Installation and Activity Brochure on Kansas Army Ammunition Plant
(Reports Control Symbol DRCIS-102)

B. SOURCES AT ARRCOM HEADQUARTERS, ROCK ISLAND, ILLINOIS

1. Unpublished Material

Historic Photo File: Photos of KAAP since 1941, not arranged in any order.
Contact: Bob Boville

Industrial Facilities Inventory, two out of three known bound volumes of WWII construction plans for KAAP. Contains site plans, photos, and architectural drawings for individual structures and structural types. A key source for building information. Rock Island has possession of these inventories for approximately twenty-eight WWII installations.

"KAAP's Activities During WWII," three pages from a bound volume on microfiche in the Historical Office.

C. SOURCES AT KANSAS ARMY AMMUNITION PLANT, PARSONS, KANSAS 67357

1. Reports - Published

Corps of Engineers, U.S. Army, War Department Office of the Area Engineer Completion Report, Kansas Ordnance Plant, Job No. 42-1. Office of the Chief of Engineers, Aug. 31, 1942. Four Volumes. Bound typescripts, site plans, photos, correspondence, tables, pertaining to the 1941-1942 site construction. Also contains an architect's record sheet (Volume 4) which lists drawings by number, government job number and gives a general description or title of the drawing. Box 34.

Corps of Engineers, U.S. Army, War Department Industrial Facilities Inventory, Kansas Ordnance Plant, Parsons, Kansas. Kansas City: Office of the District Engineer, U.S. Army Corps of Engineers, 1943-1945. Three volumes (#1, 18, 25). Vol. 1 gives general information and a description of property, supplementary information, cost of project, and tabulation of equipment types and cost. Vols. 18 and 25 are addendums to Vol. 1, bringing it up to date. Most of the same material is repeated. Of particular interest are aerial photos of the site, photos (both interior and exterior) of completed buildings labeled with building number and use or function, plans of all buildings, and sections of major buildings with overall dimensions. Indexed. This information is a key source. Vols. 1 and 18 are located in Box 34. Vol. 25 is held by Joe A. Ryan, Civil Engineer for Day and Zimmermann at KAAP.

-35-

Almer, Charles, W. Jr., Report on Cartridge, 105mm: HE, MI 1000 Area Kansas Army Ammunition Plant. Dover, New Jersey: Artillery Mortar Ammunition Branch, Ammunition Development and Engineering Directorate, Picatinny Arsenal, Nov. 1971. Gives background and current information on KAAP with primary emphasis on the 1000 line loading, assembling and packing operations. Photos and text describe plant in general and 1000 line in detail. Box 35.

2. Unpublished Reports

"Ammunition Production for Vietnam -- Impact on Southeast Kansas." Box 34.

Briefing Brochures under the names of various visiting officials. Very similar to DARCOM brochure but with more specific details. Box 36.

"E.I. DuPont de Nemours & Co. Contract DAAA 09-67-C-0213. "Summary Report on Parsons Works Start-up." Refers to 1968 lead azide plant. Box 34.

Fall-Out Shelter proposal. Box 34.

"Phase II Study, Stand-By Under Power" 1953. Box 34.

"Resume of Operations, Kansas Ordnance Plant 1942-1956." Contains good, large-scale map. Box 34.

"Annual Historical Summary" (RCS CSHIS-6(R2)), Kansas Army Ammunition Plant. 1 July, 1970 to 30 June, 1971 and 1 July, 1972 to 30 June, 1973. Day and Zimmermann, Inc., Kansas Division, Parsons. Annual reports indicating plant production, employment, quality trends for year supplemented by daily bulletins and plant newspapers. Typescript. Box 35.

"Analysis of Job Supply and Demand in SE Kansas Resulting from Personnel Reductions at KAAP" 1972. Box 36.

Bi-Annual Historical Reports. Very helpful reports with information on general lay-out, production, finances, personnel.

"Report of the Meeting at DuPont de Nemours & Co., Wilmington, Delaware on 3 May, 1967." Lists manufacturing facilities and support buildings necessary for lead azide and sodium azide facility (3000 area). Contact: L.W. Bailey, Chief, Operations Review Division.

3. Newspapers

The Parsons Sun, 1941 issue with headlines announcing appropriations to build the plant. Box 34.

KAAP NEWS, March 15, 1968 to May 15, 1968. Plant newspaper. Box 36.

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The KAAPSULE, July 1970 to November 1971. Plant Newspaper. Also, October 1971 special edition for thirtieth anniversary of plant. Box 36.

Manila folder with news clippings from PARSONS SUN. Box 36.

The Mortar Blast June 15, 1968 to July 1970, plant newspaper. Box 36.

VOX KOP May 1942 to December 1942. Vols. 1042, Installation newsletter.
Contact: Don Gullet.

Organization Historical Files 228-08. Newsclippings 1961-1981. In Security Office.

Plant bulletins located in Industrial Relations Office.

4. Maps and Photos

"Area Prints" A black binder containing photos and area maps with building numbers. Box 34.

"General Layout Maps" Brown binder contains early plate maps, government claims to the land, surveyors notes, etc. Very good source. Box 34.

Photo Album - 31 leaves of 8x10 black and white photos, two page inventory indicating photo number and subject. Dates on back of photos. Also includes photos of the construction of buildings and installation of equipment in the sodium azide area (3000 area). Box 35.

300 Area XM41 Mine Program, Project 55203. February 1968. Building by building construction photos and brief explanations of what the buildings are used for with explanation of process. In black notebook in Box 36.

"1000 Line Brochure" contains photos with captions of interior of plant. Not as helpful as the 300 area notebook. In light blue notebook dated 5-12-70. Box 36.

File 101-08. Technical material reference files, 1967- . Contains aerial photos. Box 36.

Aerial photos of 1100 and 900 line construction (1967). Contact: L.W. Bailey.

Photos of Filtration plant, construction, etc. in black binder Don Gullet's files.

Photos of waterworks under construction, in black binder in Don Gullet's office.

Construction of waterworks, 8x10 black and white photos in black photo album in Superintendent's Office.

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Photo Album, May 1942 to December 1942 lists first few commanding officers with photos. Photos of Main St., Parsons and early issues of VOX KOP. In Superintendent's Office.

Photos of filtration system in black binder in Superintendent's office.

5. Unpublished Materials

Installation Historical Files 206-09, a 1952-1953 scrapbook in a brown binder in Box 34.

Installation Historical Files 250/61. Contains building numbering system with full inventory, 1941. Very Helpful. In green binder in Box 34.

"Lessons Learned" yellow manila folder, Box 34.

Manila files with pink labels contain miscellaneous and unimportant documents. except Organization Historical Files 228-08, 1967 and file 206-09, 1953 which has maps.

"Unit History of the Kansas Army Ammunition Plant" 1 July, 1972 to 30 June, 1973, Day and Zimmermann, Inc., KAAP, Parsons, Kansas. Typescript outlining mission, brief history of plant, current operations, examples of KAAP Daily Bulletin. Box 35.

Black notebooks. Four binders containing pictures of personnel receiving awards, no titles. Box 36.

Narrative description of lead azide process. Contains process, function, and location of each building. 11-26-69. Box 36.

Pictorial Review of KAAP Rehabilitation Project, 1951-1952. General operations contract #538,454. Black binder in Box 36.

List of those buried in Franklin and Fairview Cemeteries (located on KAAP site). Contact: L.W. Bailey.

6. People as Sources

Carl Allen, dug foundations.

Ralph Walker, retiree.

Don Gullet, has issues of first year newsletter, photos.

Miles Pegnes, retired plant engineer.

APPENDICES

- Appendix-1 Letter from installation listing buildings not surveyed.
- Appendix-2 List of gravestones at cemeteries
- Appendix-3 Area maps
- Appendix-4 Day and Zimmermann System Description
- Appendix-5 700 Area process description



DEPARTMENT OF THE ARMY Mr. Keenan/pg/316/421-7450
KANSAS ARMY AMMUNITION PLANT
PARSONS, KANSAS 67357 Kansas Army Ammunition Plant
HAER No. KS-4
Page 42

SARKA-CE

11 6 SEP 1982

SUBJECT: DARCOM Historical Archeological Survey

Department of Interior
HABS/HAER
National Park Service, Stop 725
Washington DC 20240

Gentlemen:

Reference subject team's historical survey of the Kansas Army Ammunition Plant 11-13 Aug 82.

Requested supplemental information follows:

a. All buildings in the 100 Area are scheduled for demolition except Bldgs 107 and 112.

b. Buildings scheduled for demolition in the 1100 Area are Bldgs 1110, 1111, 1112, 1142, 1143, and 1199.

c. Although several attempts were made, buildings in the test range area were not observed due to on-going test firing of munitions.

d. The movie on the Army's 155mm/M483 Anti-Armor Cluster Artillery round was produced in 1981 by Pierce-Davis and Associates of Arlington, TX. It is entitled "M483A1".

e. The movie on the Air Force's Anti-Armor Cluster Munitions was produced in 1981 by Honeywell, Inc., Minneapolis, MN. It is entitled "ACM Update".

Overviews of the industrial processes for the 300 and 700 Load, Assemble, and Packout areas are provided at inclosures 1 and 2 respectively.

Sincerely,

JAMES R. ALLRED
LTC, OrdC
Commanding

2 Incl
As stated

Copies Furnished:
DRSAR-ISF-R w/incl
SARKA-AO w/incl

Sherman Phillips	1866 - 1935
Willis P. Phillips	Mar. 16, 1885
Amanda Philips	1861 - 1891
Margaret Philips	1833 - 1922
Eli Phillips	Aug. 11, 1884
Newton J. Inarp	1859 - 1914
Eddie Murel Joseph	1902
Thomas Corwin Joseph	1850 - 1924
Cyrus R. Joseph	1890 - 1919
Susanna M. Joseph	1850 - 1915
Gracie E. Joseph	1883 - 1897
Mary Ettie Lumm	1885 - 1886
Eleanor E. J. J. Lumm	1846 - 1883
I. N. Joseph	1881
Lewis A Bradfield	1882
Mallie L. Bradfield	1884
Albert L. Tharp	1886
Morgan Tharp	1879
C. R. Tharp	1861 - 1928
Allen C. Phillipy	1888 - 1911
Alexander W. Phillipy	1888 - 1890
Anna Mabel McIntosh	1882 - 1882
Paul Skelton	1879 - 1879
George O'Farrell	1867 - 1926
Laura O'Farrell	1868 - 1902
C. P. King	1863 - 1911
Micheal Elledge	1843 - 1882
Oron O. Davis	1873
Sarah M. Towles	1876
Online Cook	1833 - 1892
Crowell Cook	1816 - 1902
Harriett Cook	1877
Lanty Eller	1847 - 1928
Ida McCallister	1900

Franklin Cemetary (cont.)

Kansas Army Ammunition Plant

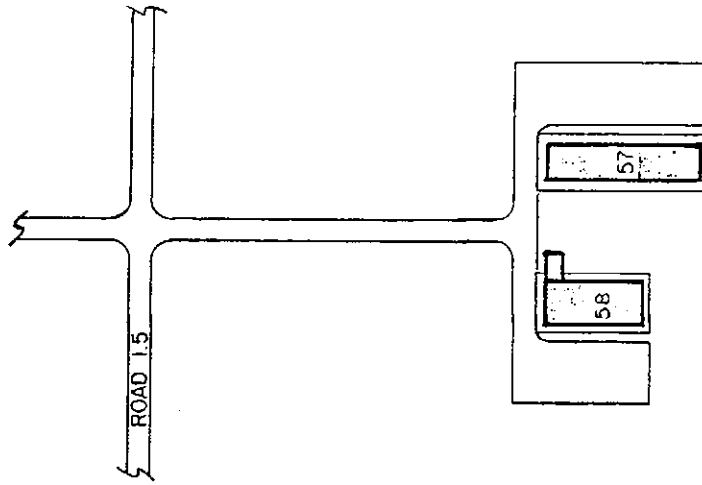
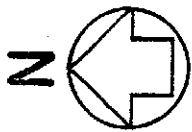
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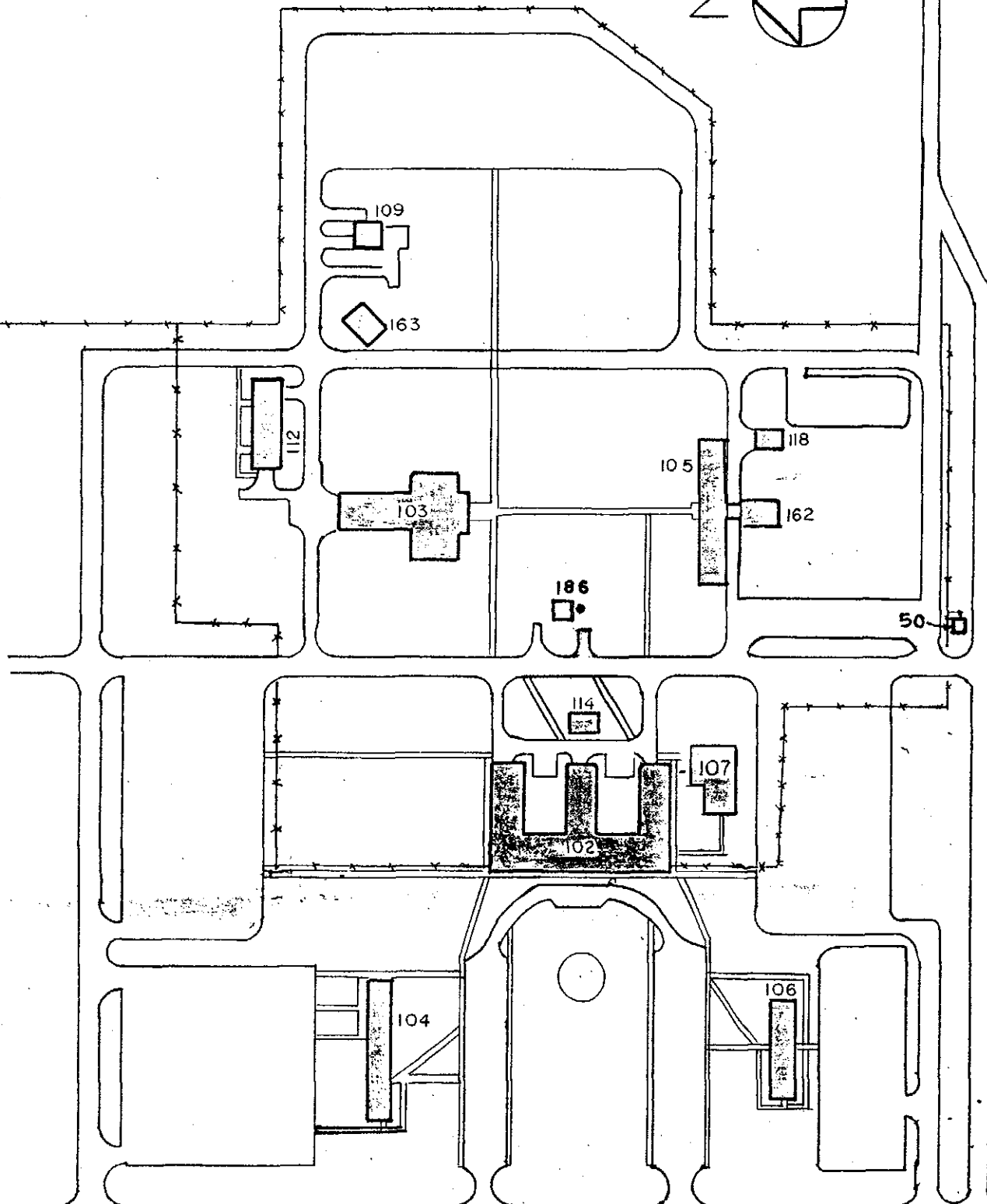
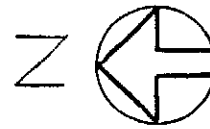
A. H. Wells	1831 - 1904
Elizabeth Bay Pallett	1844 - 1882
Robert P. Pallett	1830 - 1909
Florence K. Pallett	1845 - 1924
Laura P. McCamish	1882
Willie T. McCamish	1882
J. R. Towles	1846 - 1915
L. P. M. W. T. M.	no date
D. A. Kimbrough	1821 - 1902
Isaac B. Sims	1881 - 1884
James F. Sims	1851 - 1883
Clinton Billings	1890
Nora Isabell Trimble	1883
Albert Sydney Wells	1879 - 1895
Jennie Wells	1870 - 1871
Samuel Frame	1870
George W. Stemple	1879
Maggie J. Stemple	1876
William C. Stemple	1887
James A. Pyland	1882

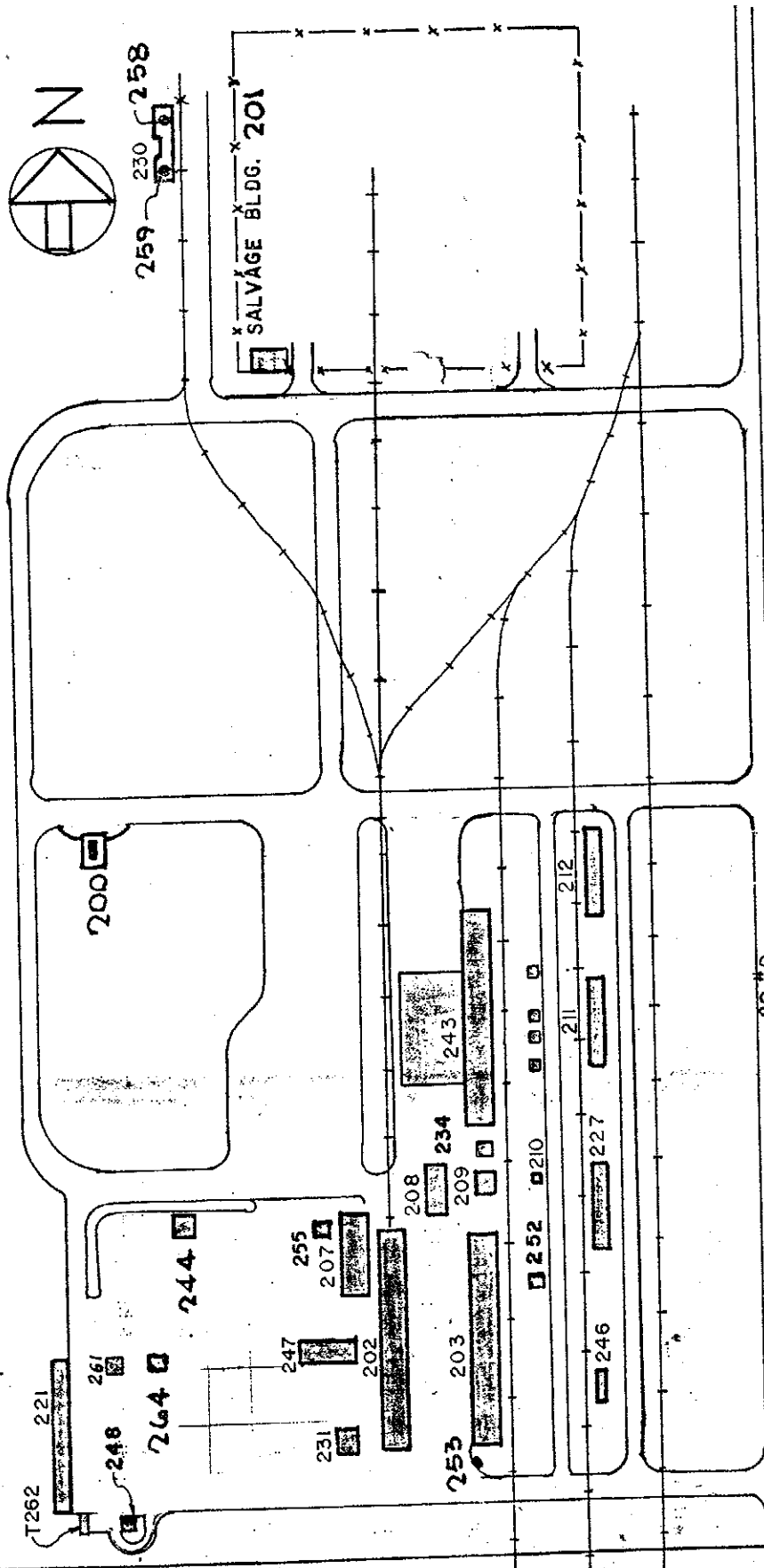
FAIRVIEW CEMETARY

Ellen Louise	1925 - 1931
Charles	1913
Charles E. Attebery	1872 - 1915
Cora I. Attebery	1873 - 1950
G. O. D.	
Giralda O. Davis	1869 - 1886
J. A. Young	1852 - 1924
Rachel Ann Young	1863 - 1941
Frances Olive Spurgeon	1920
Nancy Gilber	1919
J. W. B. Tucker	1882
H. Lenore Murray	1886
Hellen F. Murray	1886
Betty Maurine Cares	1928 - 1929
Willard A. Cares, Jr.	1925
John P. Cares	1840 - 1911
W. N. C. O. P.	
Anna Hinsey	1856 - 1924
Wilber N. Cares	1883 - 1908
Jacob Powell	1888
Chairty Powell	1888
Orval Powell	1889
George W. Wolverton	1826 - 1898
David Ulery	1884
Elizabeth F. Clinedinst	1882
H. Morton Bradford	18--
Herby M. Davis	1885
Minnie L. Leaverton	1886
Clauda M. Travis	1882
Clifford Ammons Bradfield	1883 - 1886
J. W. Fisher	1841 - 1899
Ella M.	1889 - 1908
Manners	

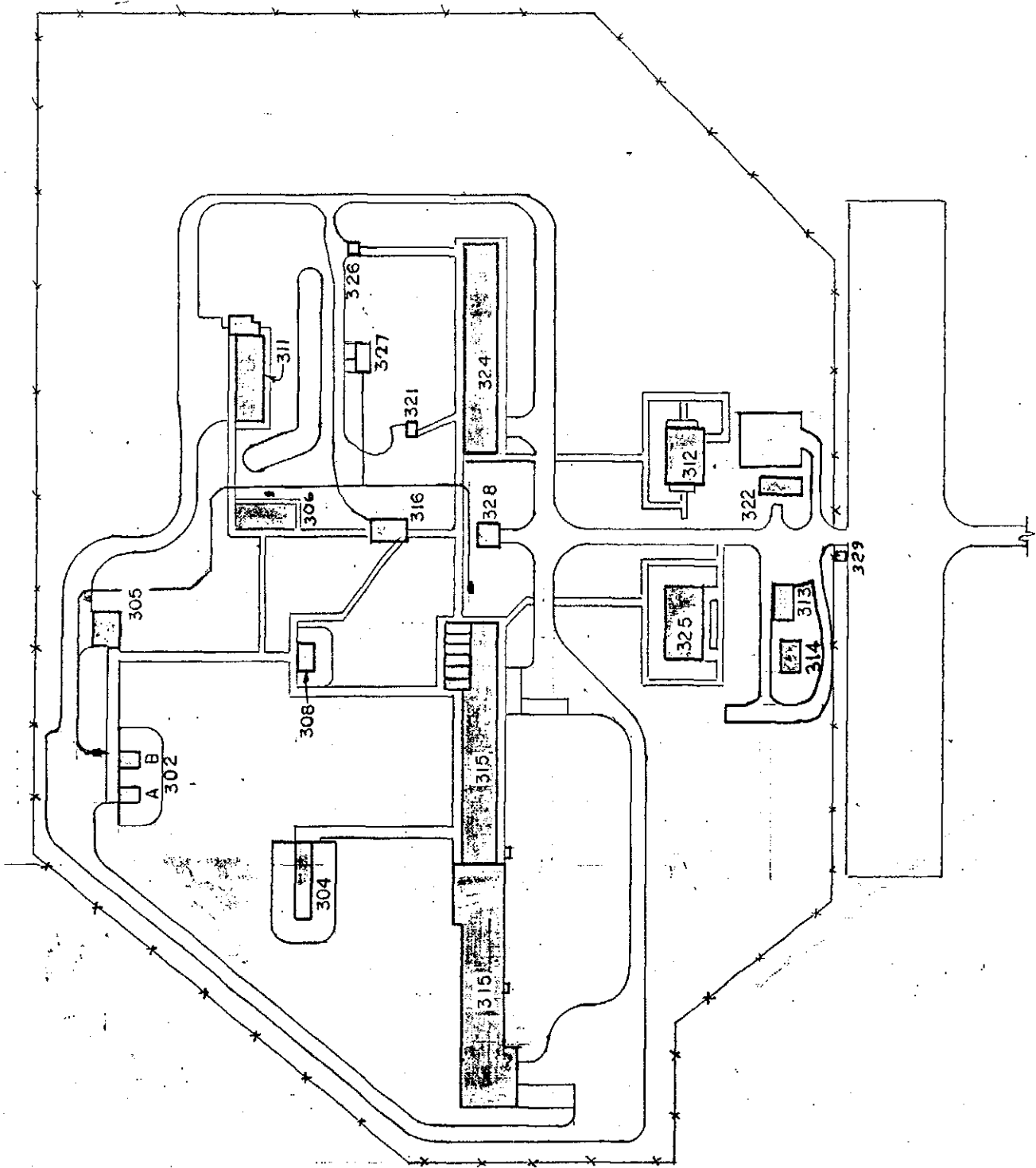
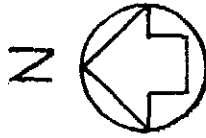


Appendix 3-1





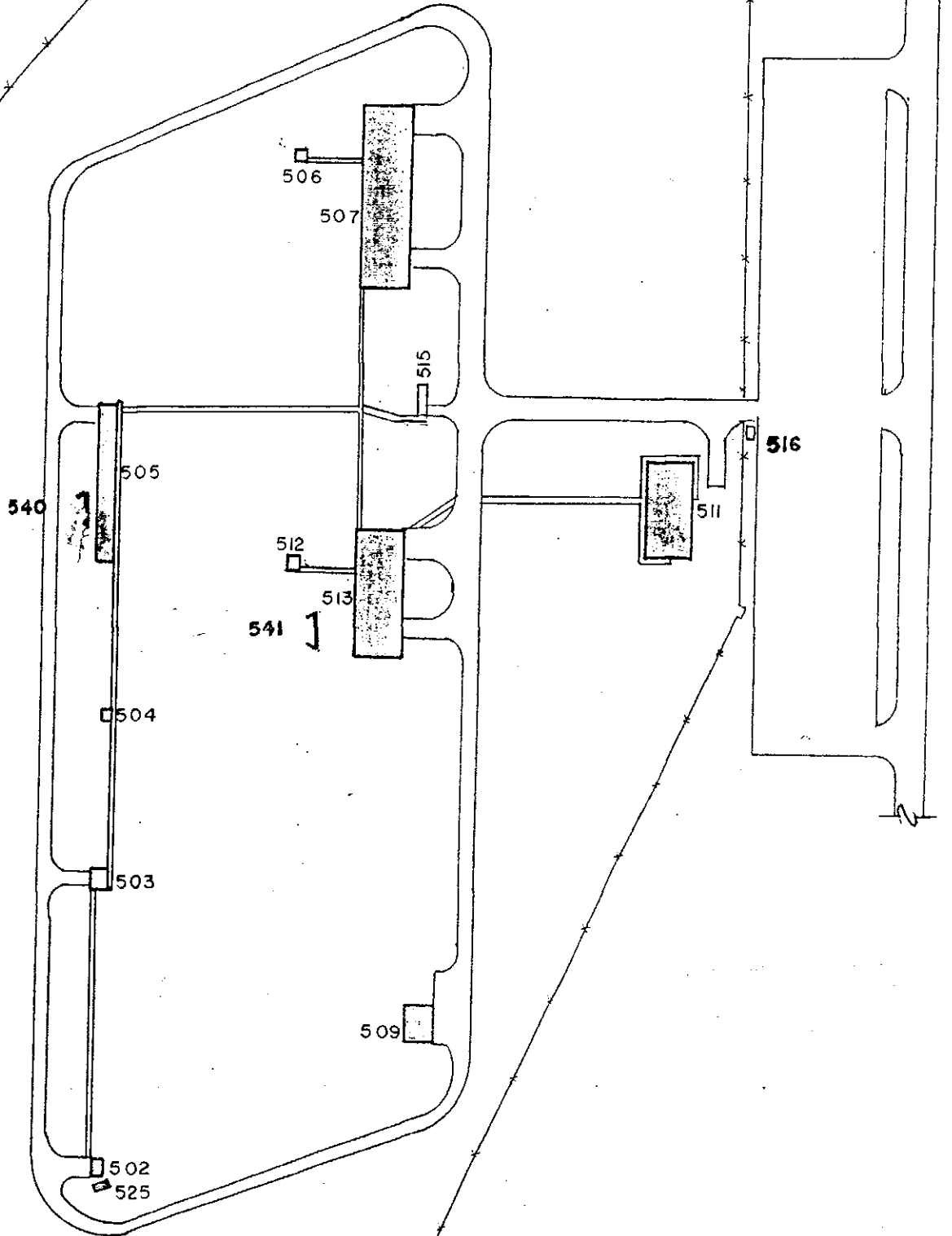
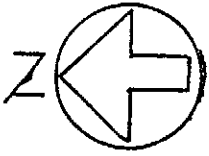
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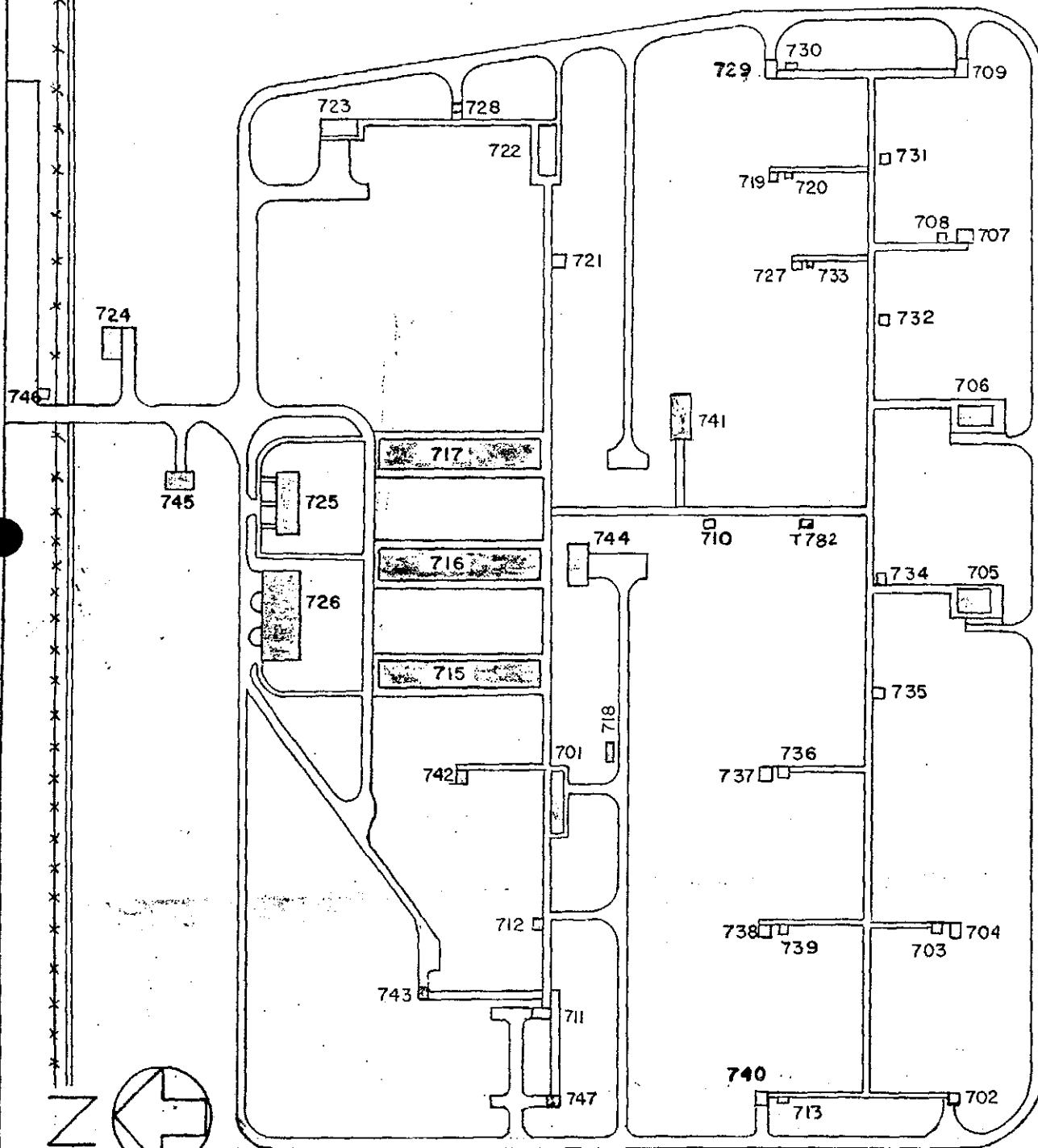


DAY & ZIMMERMANN INC.
KANSAS ARMY AMMUNITION PLANT
PARSONS, KANSAS

Appendix 3-4

300 AREA LAYOUT

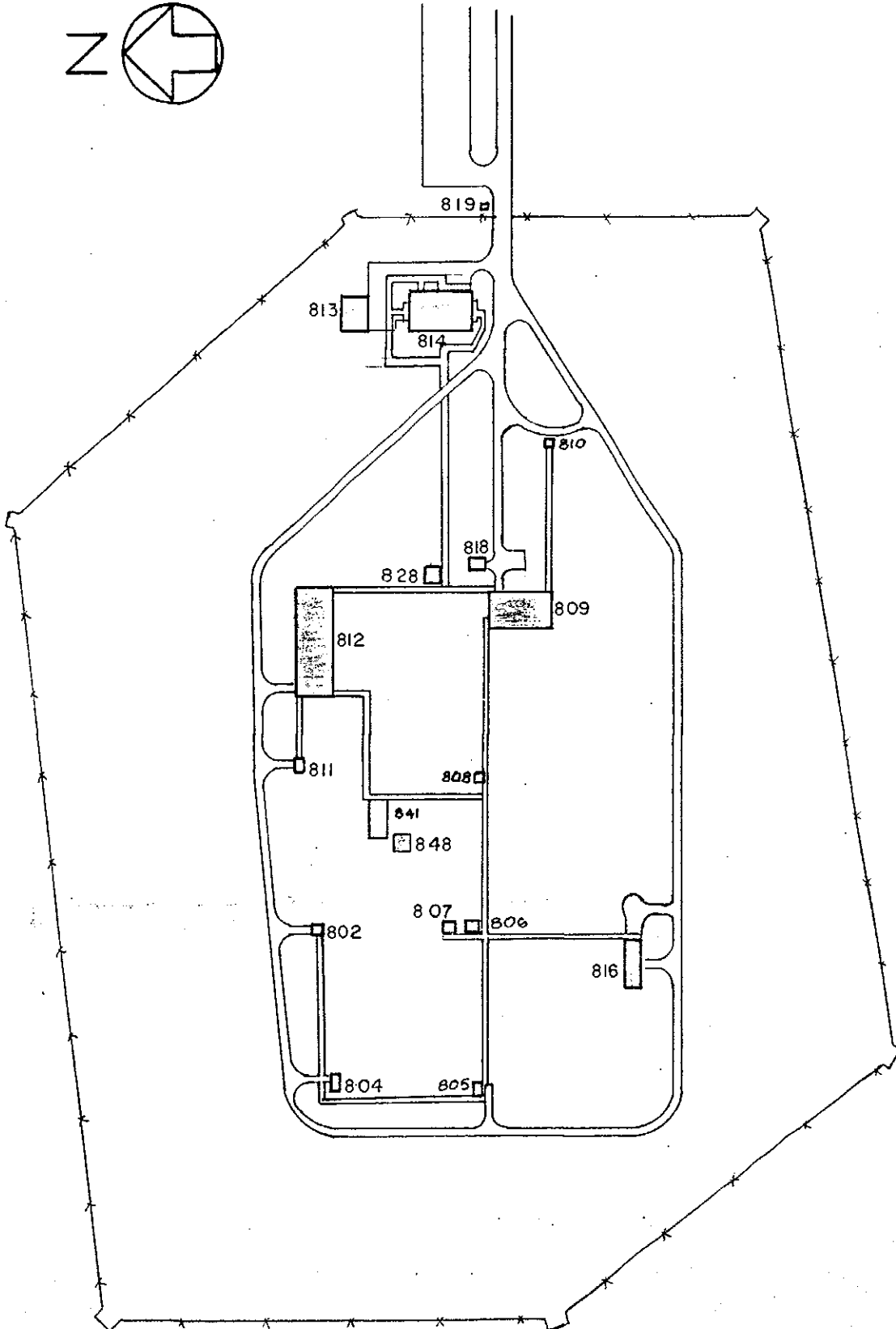




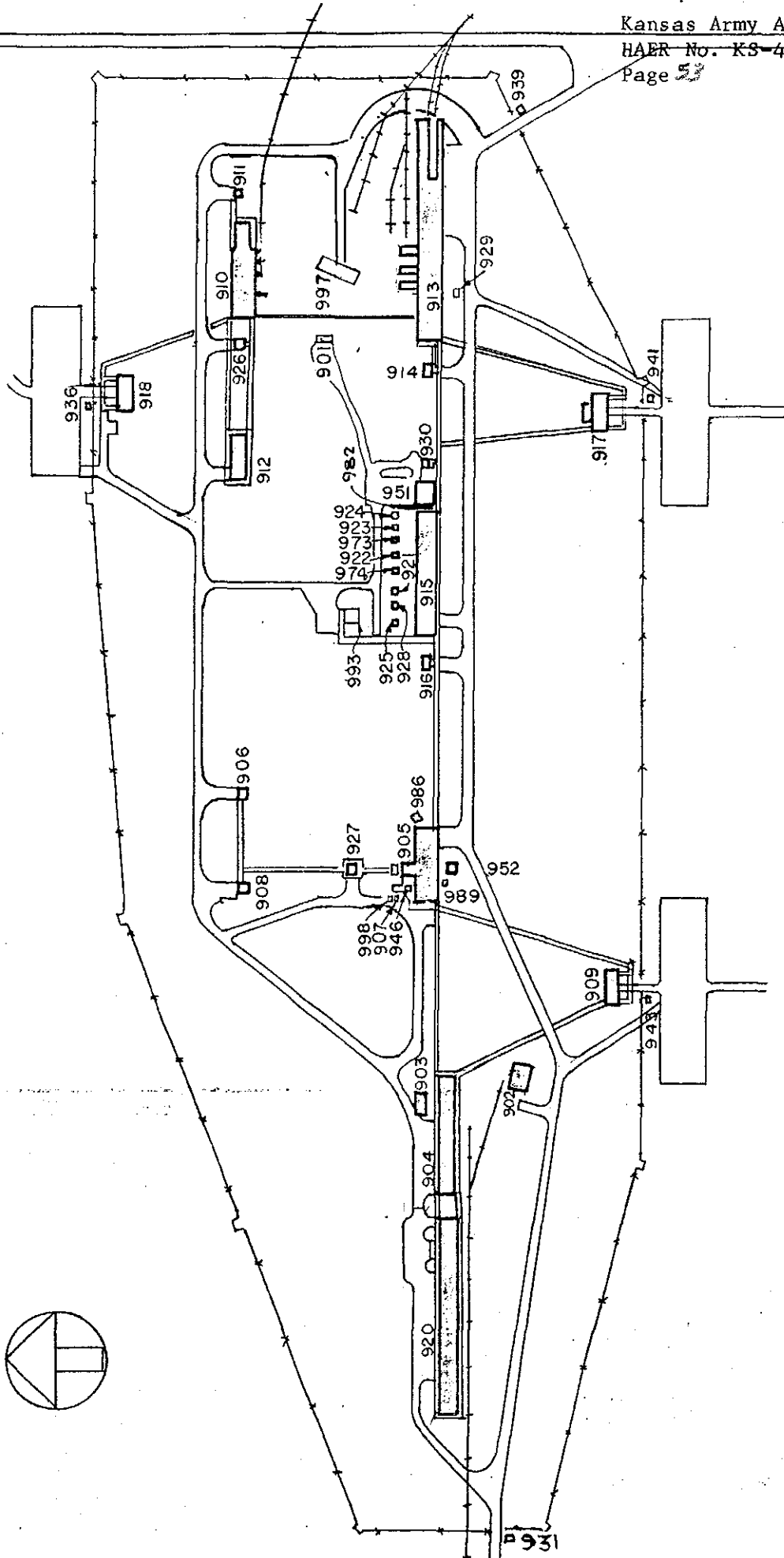
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DAY & ZIMMERMANN INC.
 KANSAS ARMY AMMUNITION PLANT

700 AREA 1 AVIATION

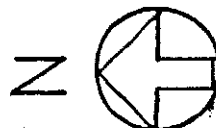


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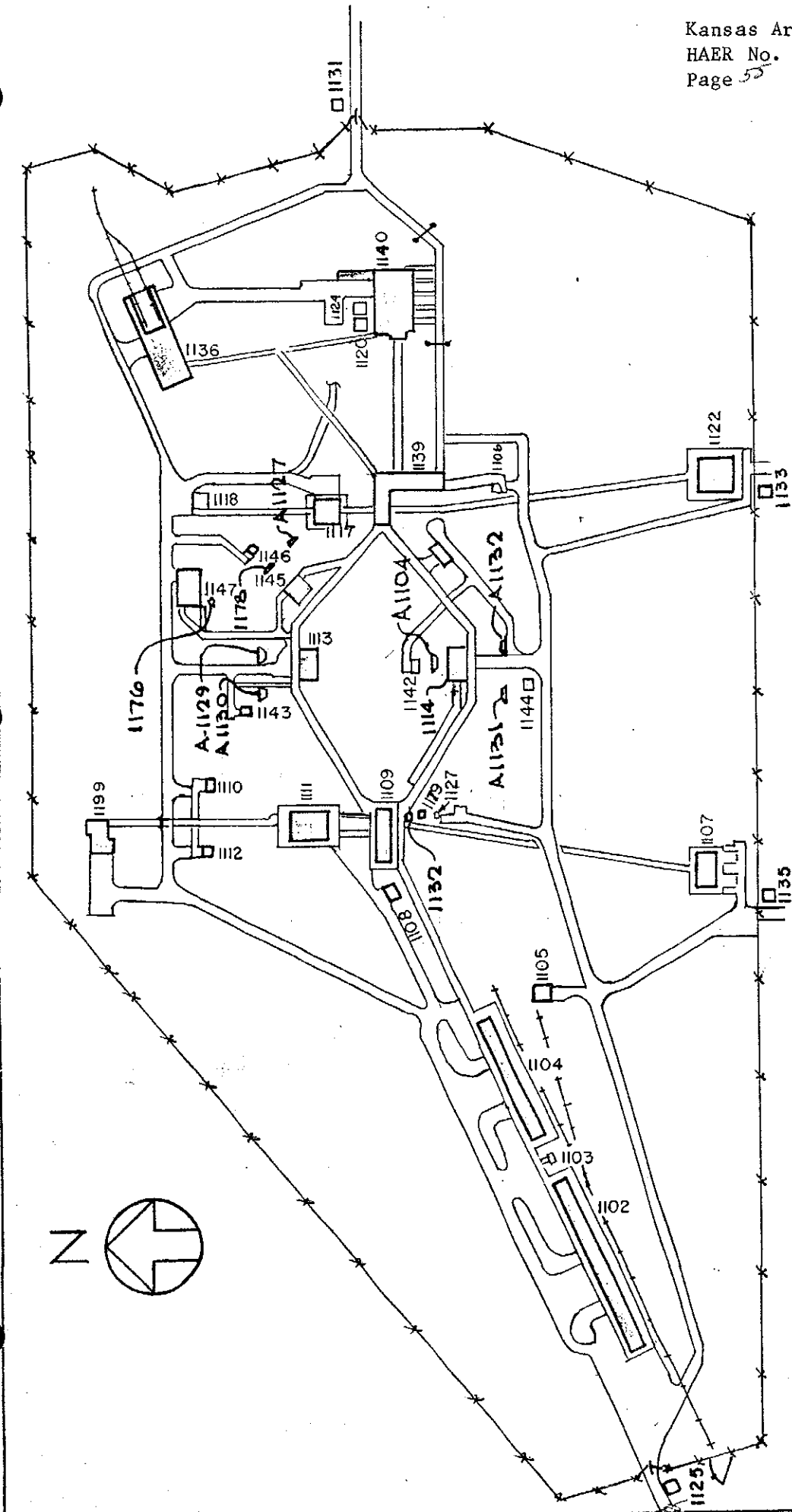


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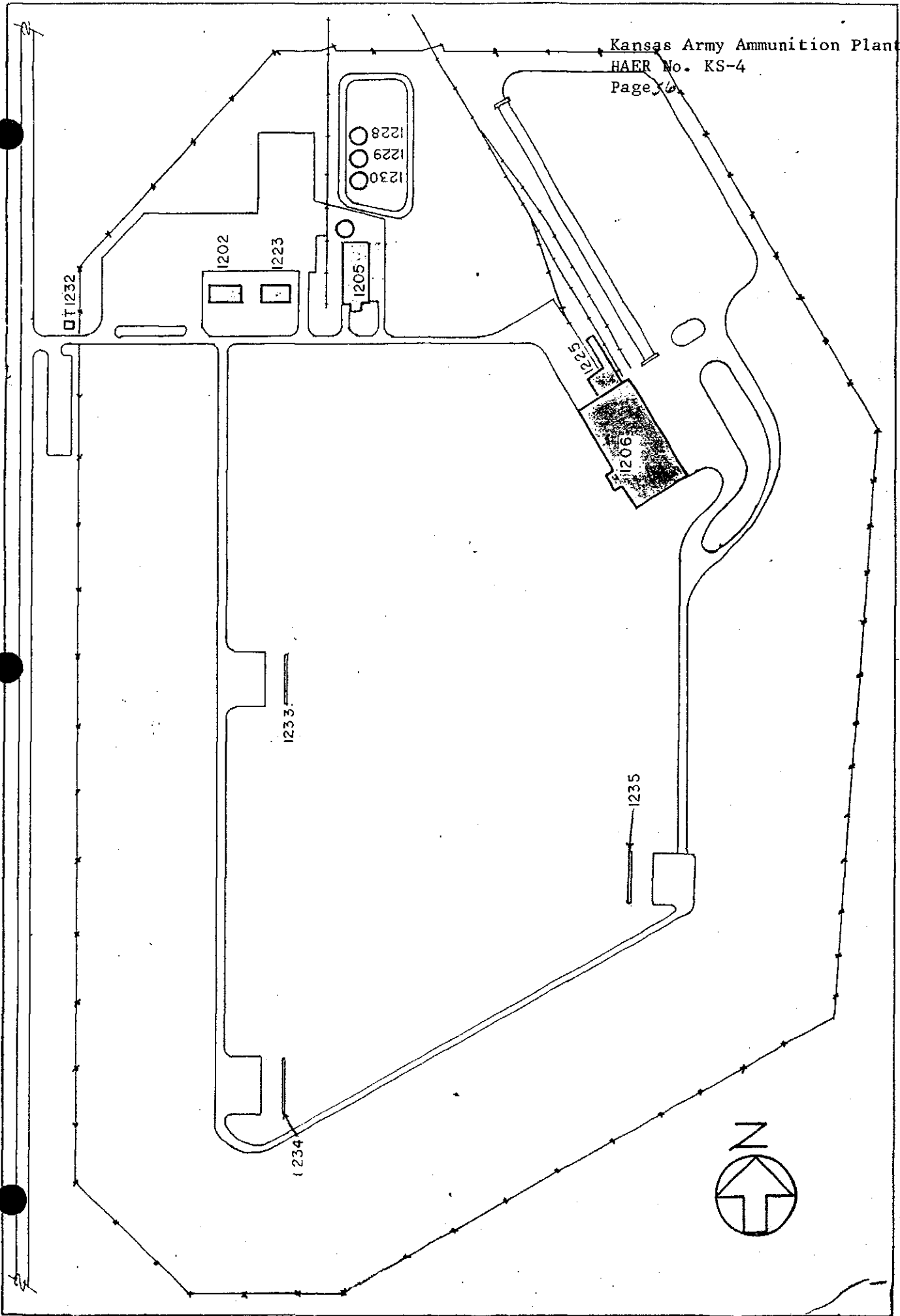


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KANSAS ARMY AMMUNITION PLANT

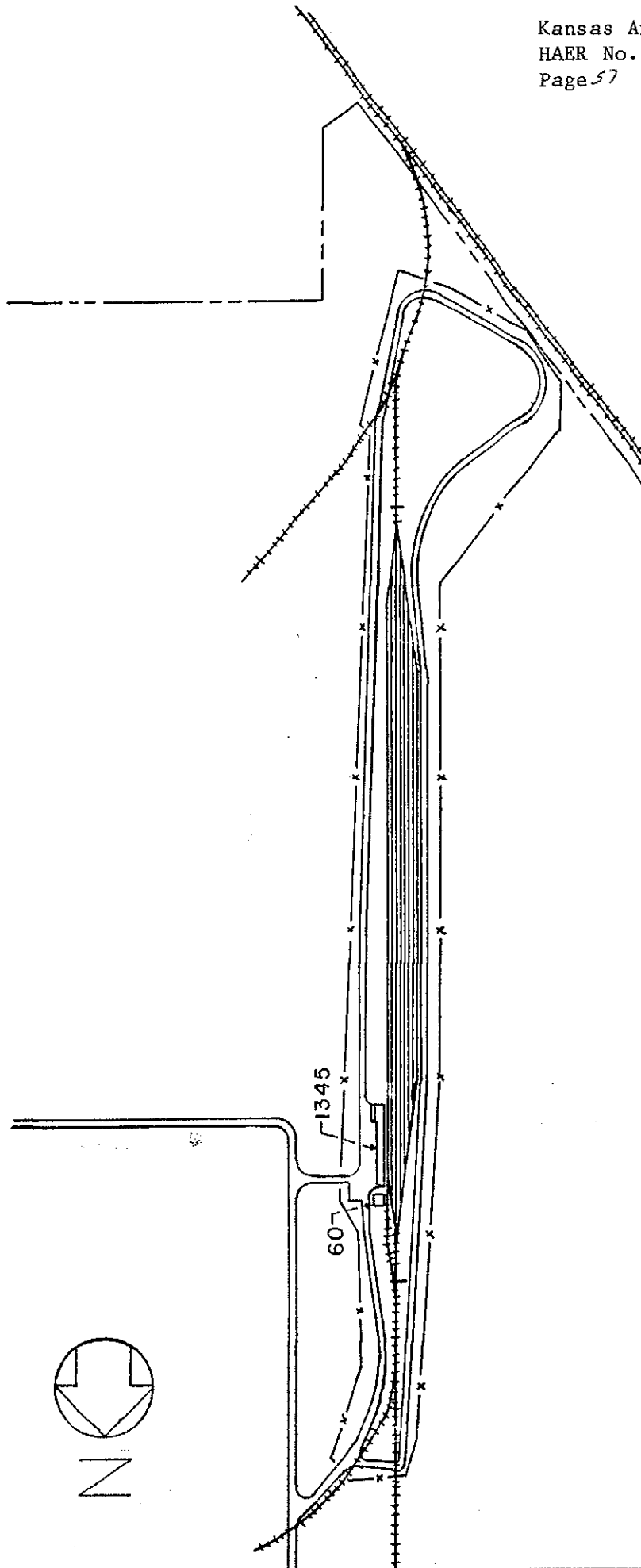


Appendix 3-10

DAY & ZIMMERMANN INC.
KANSAS ARMY AMMUNITION PLANT
PACIFIC WAREHOUSE

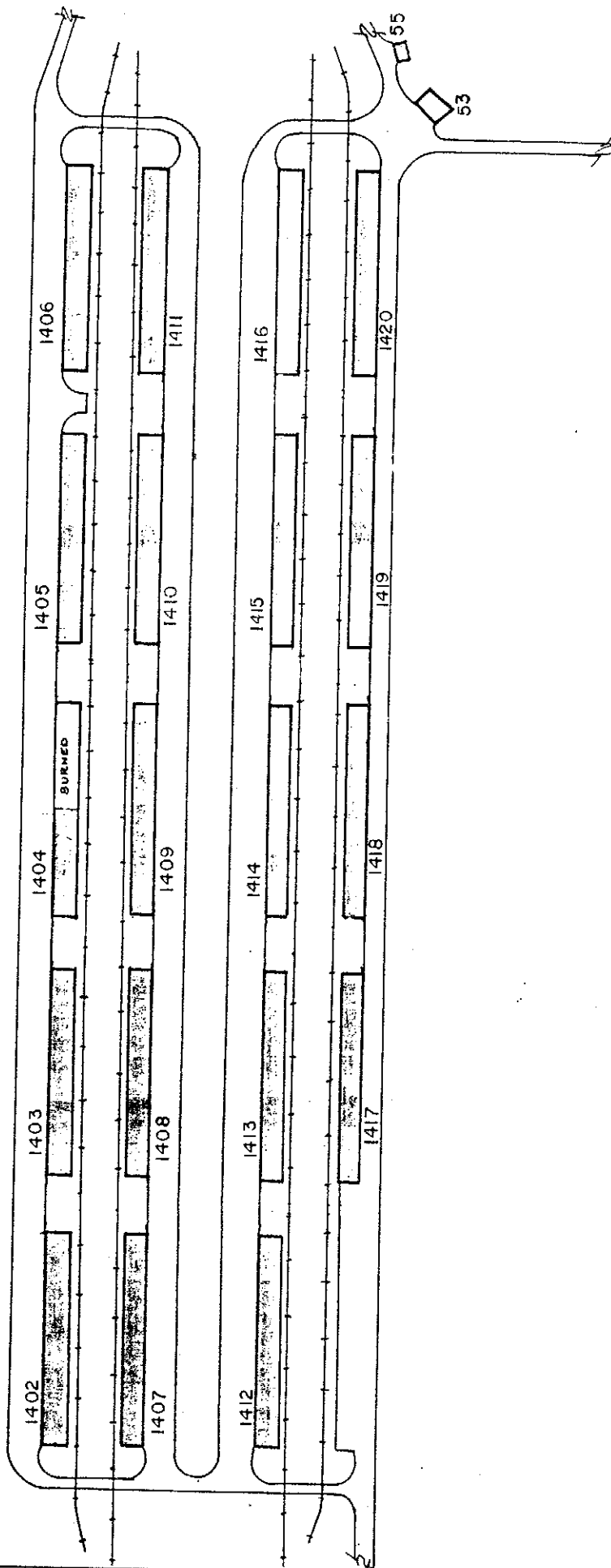


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KANSAS ARMY AMMUNITION PLANT
PARSONS, KANSAS



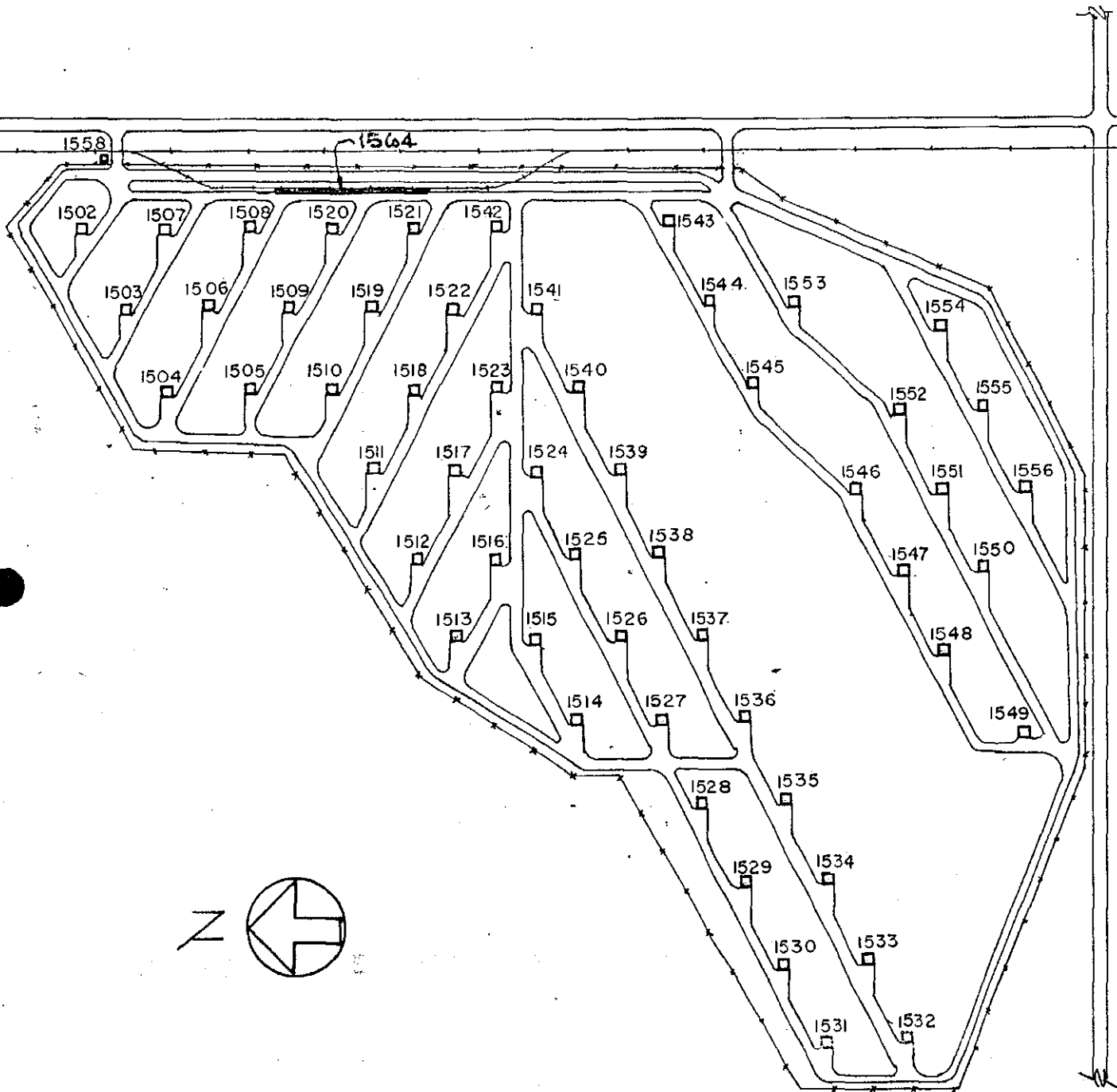
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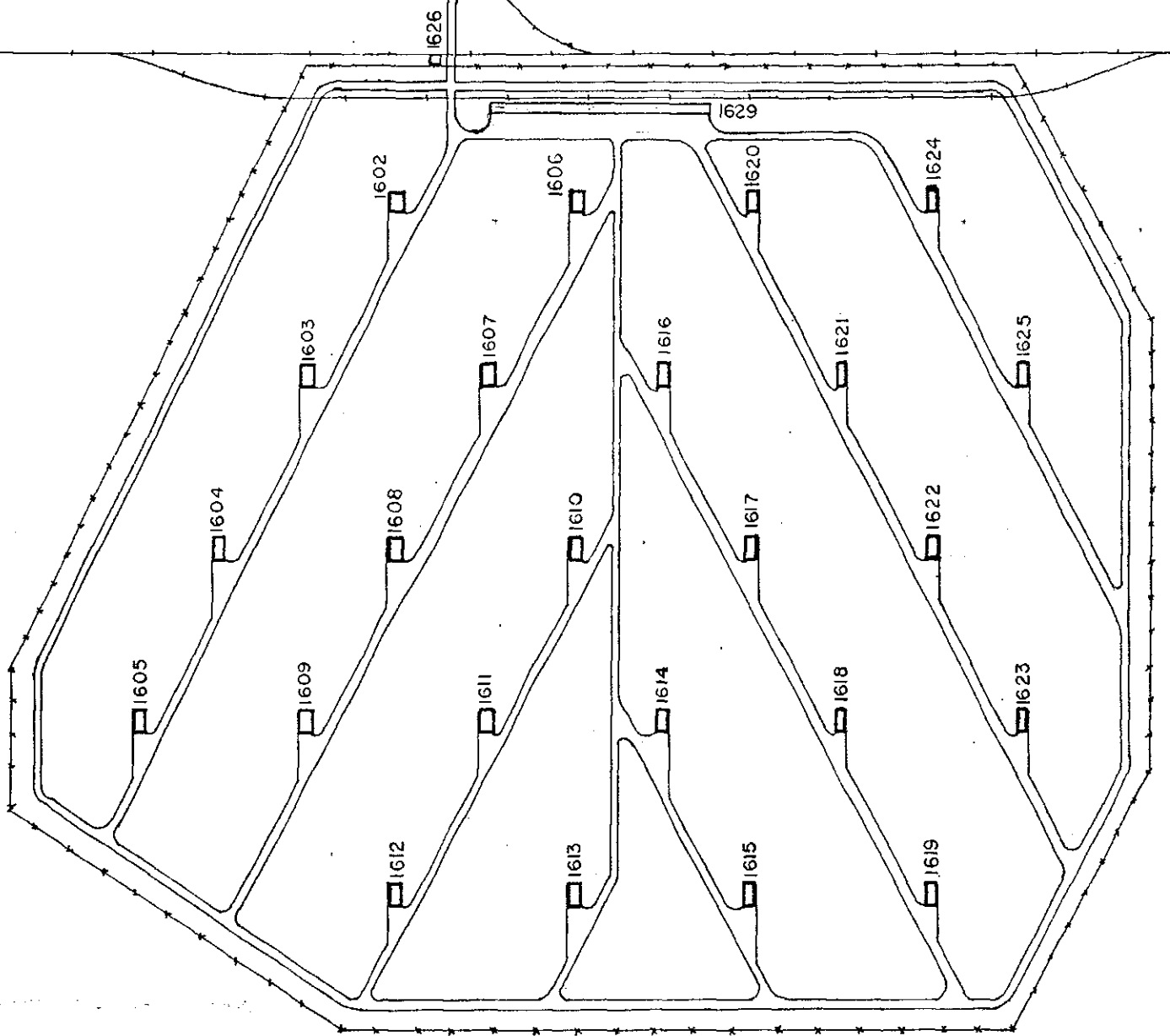
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KANSAS ARMY AMMUNITION PLANT

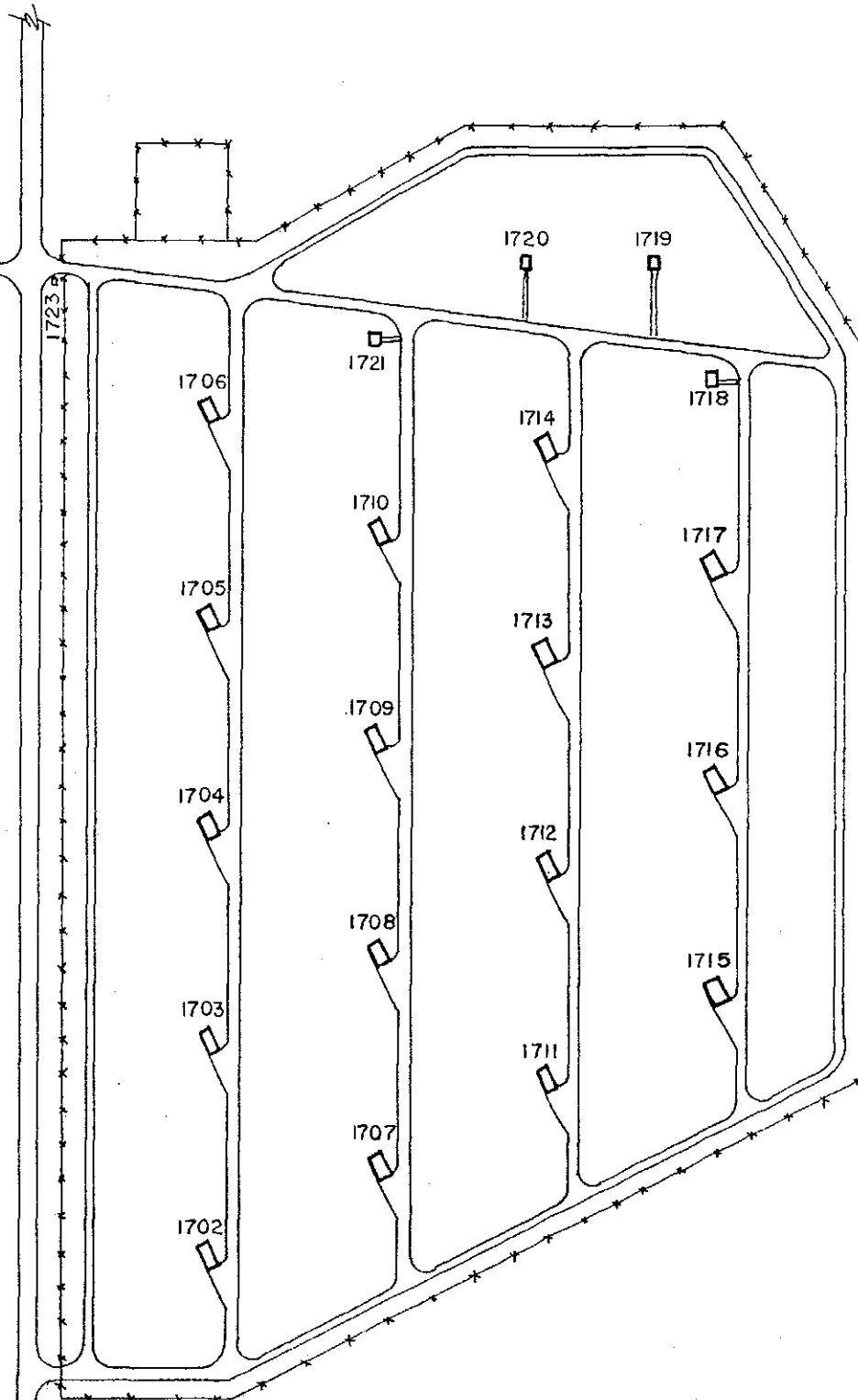
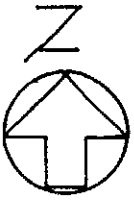


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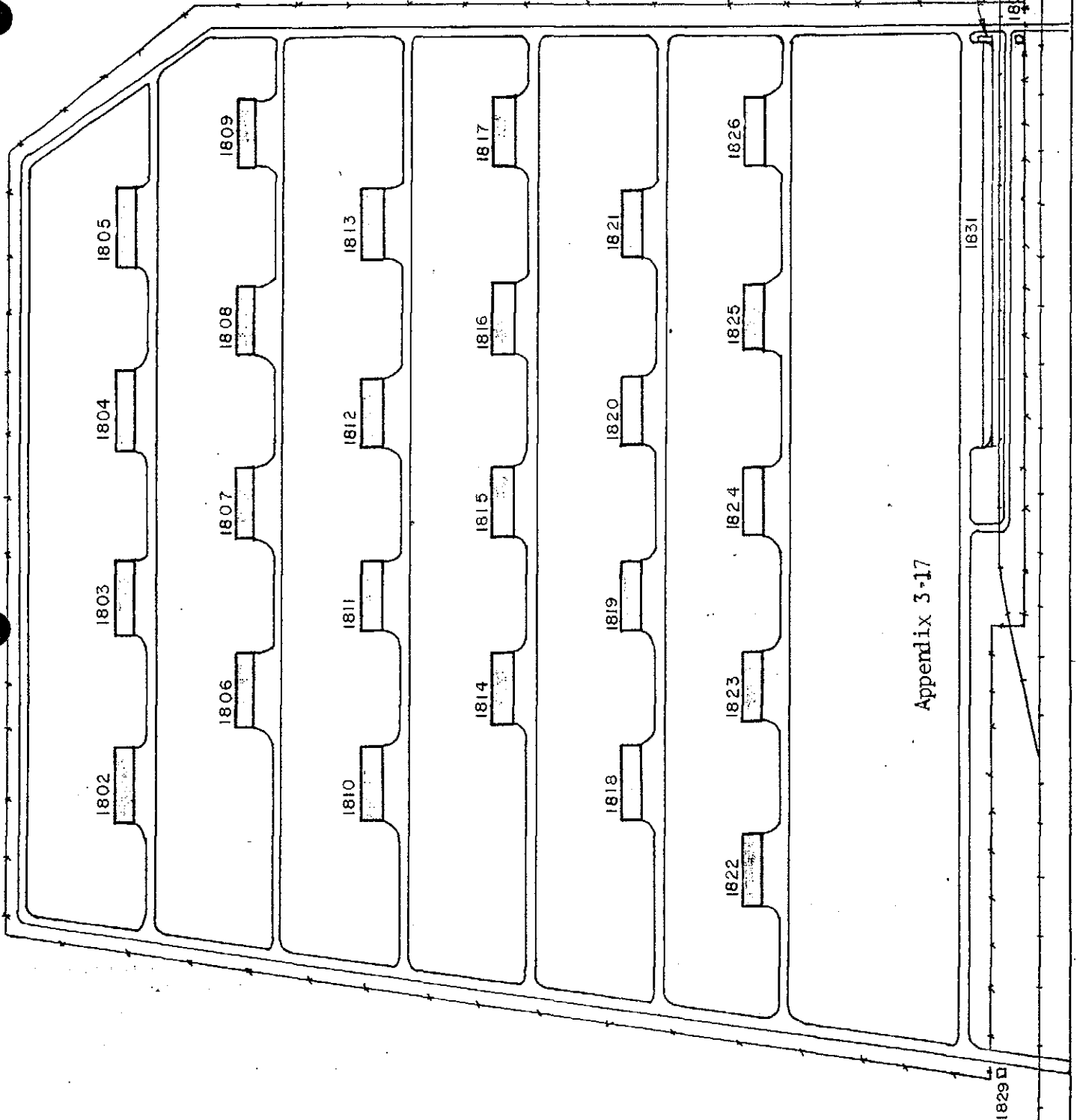
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KANSAS ARMY AMMUNITION PLANT



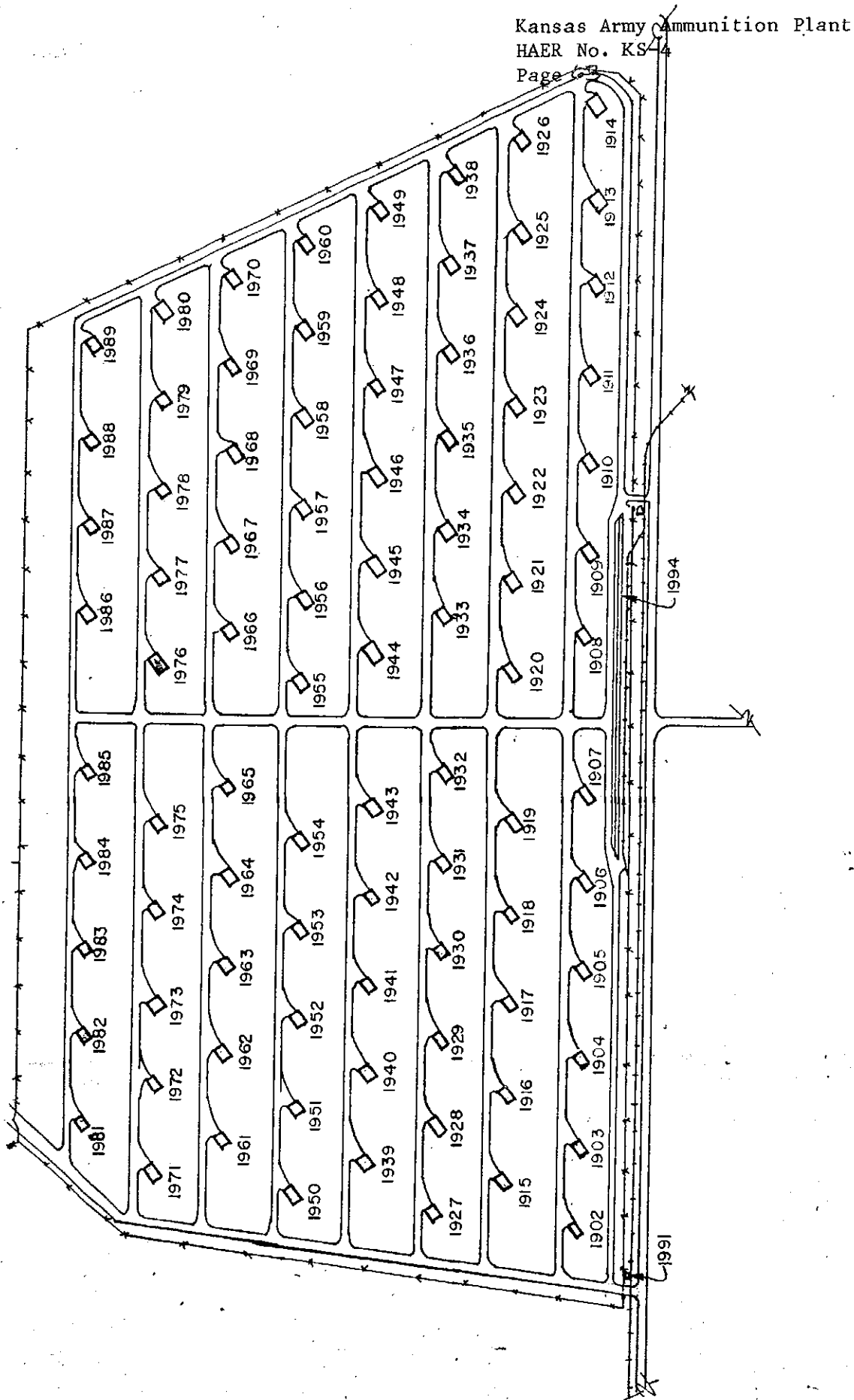
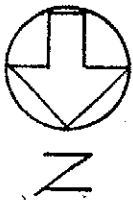




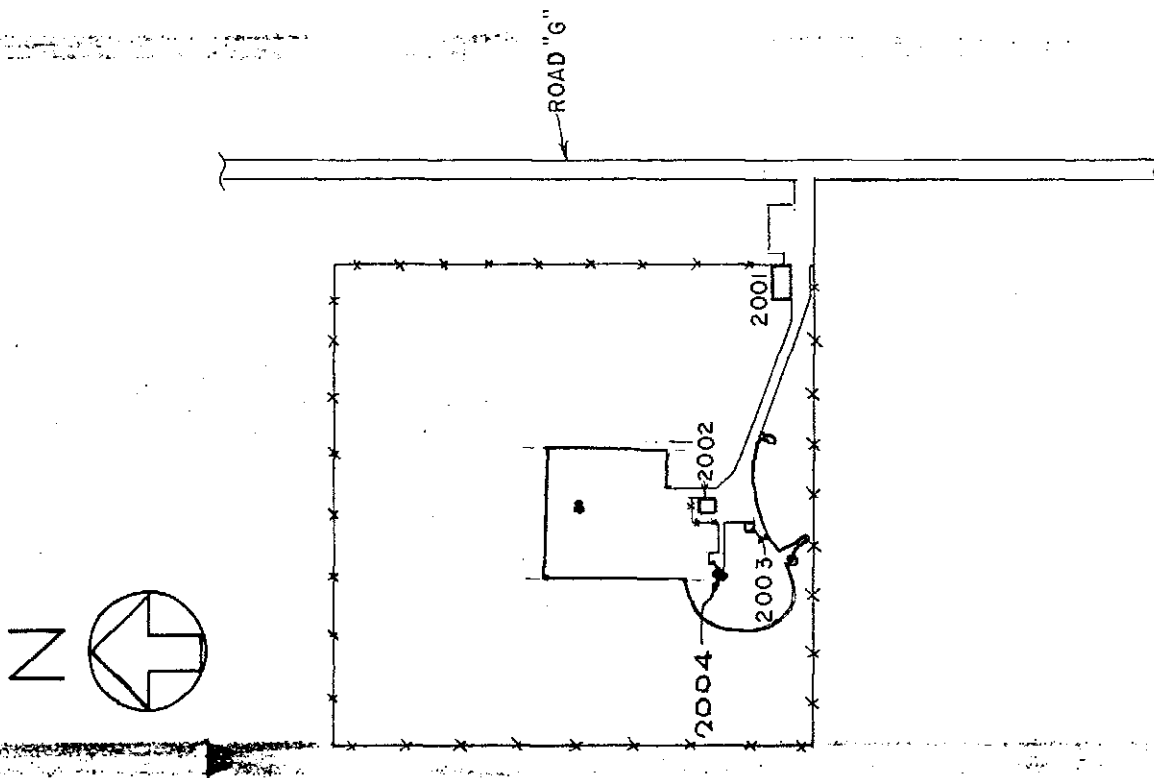
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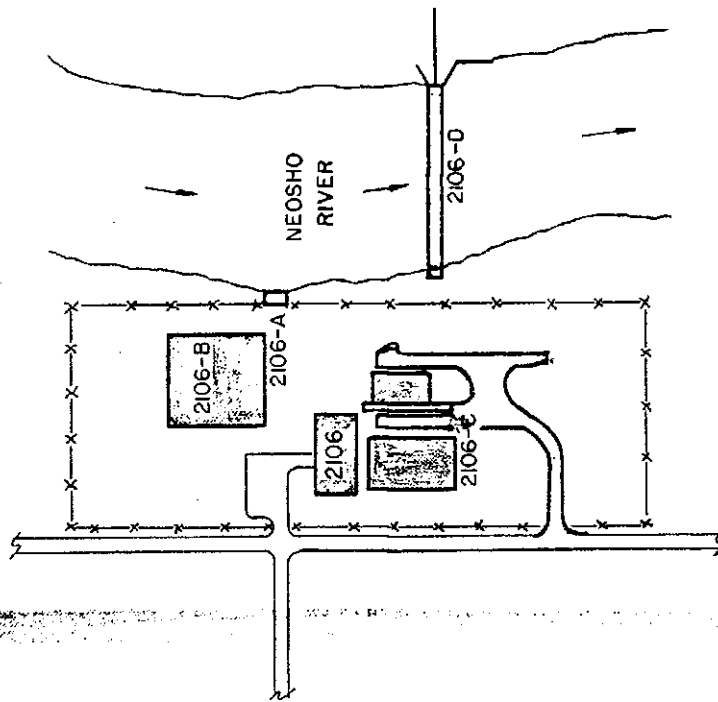
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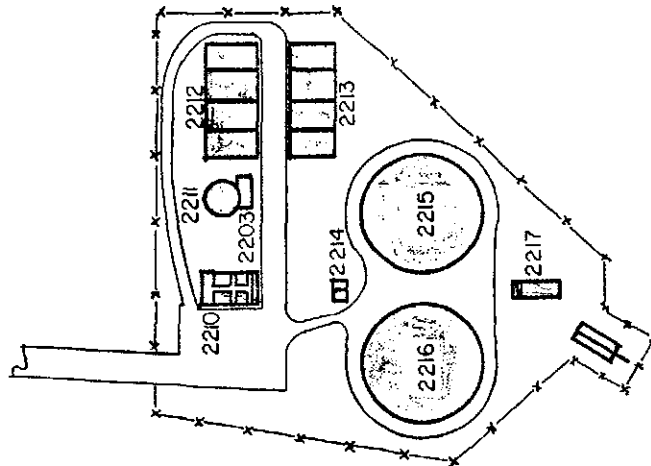
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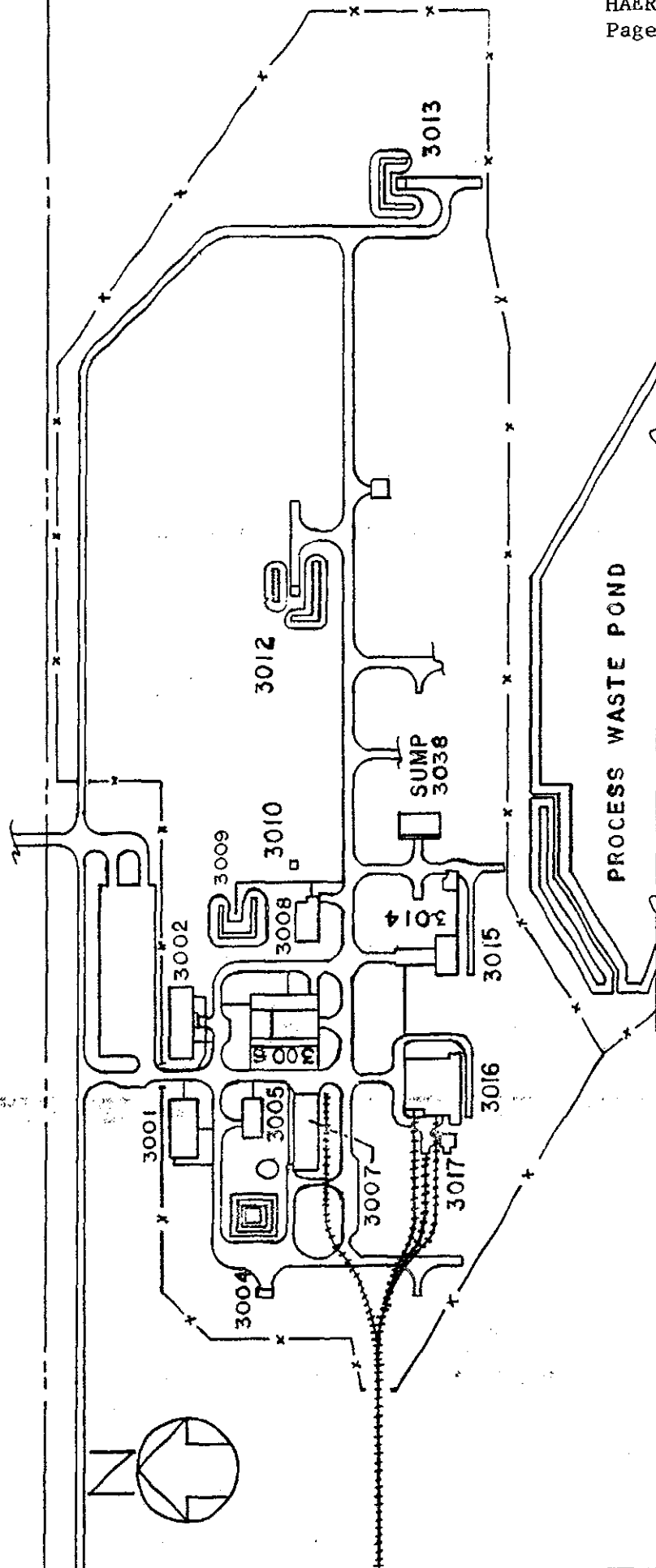
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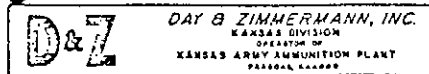


Appendix 3-21



Appendix 3-22

DAY AND ZIMMERMAN, INC.
KANSAS ARMY AMMUNITION PLANT



Kansas Army Ammunition Plant
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I. SYSTEM DESCRIPTION

1. Narrative of System Operation

1.1 Adapter Hardness Tester

Adapters are received from Stores and manually removed from cartons and placed on the hardness test conveyor. The adapters are automatically spaced apart and passed through the Eddy current coil to be tested. Acceptable parts continue on to the next operation while rejected parts are diverted from the conveyor for manual checking. Acceptable parts are bulk loaded into boxes and transported on carts to the final assembly and pack area.

1.2 Grenade Body Hardness Testers, Lead Insertion and Foil Insertion Systems and Automatic Traying

Hardness Test - Grenades are received by truck from General Stores. Boxes of grenades are opened and placed on each hardness test line. The bodies are conveyed through a degaussing coil to eliminate any residual magnetism, then through an Eddy current coil to be tested. The accepted parts continue on to the lead insertion machine while rejects are diverted from the conveyor for manual checking.

Lead Cup Machine - Lead cup assemblies are received from the 700 Line through Building 326 and manually dumped into a vibratory feeder, which feeds the lead cup to the lead cup insertion machine. The lead cup machine automatically receives bodies via conveyor system from the hardness tester and receives lead cups from the syntron feeder system via conveyor system, to be automatically inserted and pressed into the hole in the top of the grenade body. After a 100% manual inspection for the lead installation, the body is conveyed to the foil operation.

Automatic Foil Machine - The acceptable parts from the lead insertion machine are conveyed ten (10) at a time into the foil machine. The foil machine automatically places a round foil disk over the lead cups. The grenade bodies are then conveyed to the traying machine.

Automatic Tray Loading Machine - Accepted parts are loaded into trays (64 per tray) by the automatic tray loading machine. These parts are then visually checked for presence of foil on the leads and then placed into a 48 tray buggy.

Loaded buggies are transported by jeep to the storage area for use on demand.

I. SYSTEM DESCRIPTION (cont)

Kansas Army Ammunition Plant
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1.3 Body Loading Systems

Trayed M42 and M46 grenade bodies with lead charges are manually placed into the tray unloading machine. The tray unloading machine automatically removes the grenade bodies from the tray and feeds the bodies to the nest assembly machine, which automatically receives the grenade bodies and next via conveyor system and automatically assembles the nest to the grenade body.

The Composition A-5 powder is received on the back line and processed; twenty-five (25) pounds to individual stainless steel containers, which are then loaded on the automatic powder feed system to be transferred and distributed to the proper loading system. This is an automatic car dispatching system that distributes powder on demand to each pelleting press every four and one-half (4½) minutes and/or as required.

The rotary consolidating press receives the grenade body and nest via conveyor system and receives Composition A-5 on demand via automatic powder distribution system. The rotary consolidating press automatically loads powder into the grenade bodies, and in two stages, consolidates the powder. (Consolidation pressure is approximately 13 tons, dead load. Press is instrumented to control the amount of powder that is consolidated into the body.)

The disassembly machine receives the grenade body and nest via conveyor system and automatically disassembles the grenade body from the nest. The loaded body continues on to the next operation and the nest is conveyed to the ultrasonic nest cleaner to be cleaned automatically of excess powder, and then returned to the assembly machine via conveyor system (nests are cleaned in a Freon TA solvent).

The cones are received from Building 324 and loaded manually into the supply hopper. The supply hopper feeds the cone vibratory feeder on demand.

The rotary swaging machine receives the grenade body and cones via conveyor and vibratory feeder system. The rotary swaging machine automatically swages the cone into the body. The cone is inserted and force is applied to the cone to insure the cone is properly seated against the charge. (Approximately 5 tons pressure are applied to the swaging operation.) (The rotary swaging machine is instrumented so that the swaging pressure is recorded on each part.)

The automatic gaging machine receives the grenade bodies from the rotary swaging machine via conveyor system. The gaging machine automatically checks the height of the cone in the grenade body. All rejected parts exit from the machine through a reject chute. All accepted parts continue on to the next operation, following a 100% visual inspection for cracked grenade bodies.

I. SYSTEM DESCRIPTION (Cont.)

The traying machine receives the grenade bodies via conveyor system and automatically places the grenades into the trays. The trayed grenades are manually loaded into buggies for transportation to storage in Building 304 until acceptable testfire results are received.

The automatic body loading system has the capability of producing 90 parts per minute at 100% efficiency, and is monitored by the use of a remote TV monitor. Consolidation pressures are recorded and visible to operators.

1.4 Body Assembly System

The loaded M42 and M46 grenade bodies are received at the automatic body assembly system's traying and untraying machine from storage in Building 304.

The trayed grenade bodies are manually removed from buggies and fed to the untraying machine. At this point, the grenades are automatically removed from trays & fed onto the infeed conveyor of the assembly machine. Grenade bodies are automatically picked up from the infeed conveyor and placed on pallet of the assembly machine.

Grenades are automatically oriented to accept fuze assembly and are locked in position.

Fuzes are delivered to individual fuze-body assembly systems, as required.

Trayed fuzes are manually placed in automatic untraying machine. The untraying machine automatically removes fuzes from trays and feeds them into the fuze gage station.

Fuze firing pin is automatically gaged. Accepted fuzes are automatically fed into the fuze placing station of the body assembly system (this gaging operation runs slightly faster than the assembly machine to compensate for a reasonable number of rejects).

Fuze placement station - The fuzes are automatically positioned over studs on grenade body.

Fuze orientation station - The following checks are automatically performed to insure proper positioning of fuze on body:

- a. Orientation of fuze on grenade studs
- b. Position of arming screw
- c. Presence and position of spiral pin

Clinch fuze - The body studs are automatically staked to fasten the fuze assemblies to the body (staking pressure is regulated and monitored by means of a hydraulic control system).

I. SYSTEM DESCRIPTION (cont)

Tape stiffener assembly - Delivered to individual assembly systems by manual push cart as required and the tape stiffener assemblies are manually placed on circulating ribbon staking fixtures.

The staking fixture with tape stiffener assembly is automatically positioned over the arming screw of the fuze.

The tape stiffener assembly is automatically clinched to the rivet end of the fuze arming screw (staking pressure is regulated by a hydraulic control system).

The staking fixture is removed from the assembly machine and recirculated for placement of more tape stiffener assemblies.

The grenade assemblies with tape stiffener assembly are conveyed to the tape stiffener winding fixtures where the tape stiffener assemblies are automatically wound.

The grenade assembly is now complete and automatically removed from the assembly machine and placed on outfeed conveyor to be carried to traying station where the accepted grenades are trayed and placed in buggies for storage in Building 304.

Each automatic body assembly system operates at a machine rate of 30 ppm @ 100% efficiency.

1.5 Final Assembly and Packout System

When appropriate functional tests have been performed on fuzed grenades, and lot accepted, the buggies are transferred from storage, Building 304, to the final assembly building, as required. Trays are manually removed from buggies and placed on operator's table. Eight (8) grenades and appropriate spacers are placed into the clustering block and then conveyed to each downloader station for loading into projectile.

After projectiles have been issued to Production, they are manually removed from the pallet and placed on projectile preparation table. The projectile interiors are lubricated and then conveyed by conveyor to the projectile placing station.

The projectile placing station automatically places the projectiles in a pallet on the flat top continuous chain conveyor.

Projectile is oriented (keyway forward) and cargo backup ramp is extended (station will not release projectile until both operations have been performed).

Perform preliminary inspection on forward plate, "O" ring and rubber pad; grease "O" ring and assemble forward plate and "O" ring; place rubber pad on forward plate, orient forward plate in projectile, and release pallet to first grenade loading station.

I. SYSTEM DESCRIPTION (cont)

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Load layers - 1 through 8 with M42 grenades and 9 through 11 with M46 grenades. Eight (8) grenades with spacers are removed from the clustering block by an air operated clustering fixture and manually placed in the projectile. Automatic pressure head extends, pushes grenades into projectile, pulls spiral pins and retracts to "up" position. The spiral pin tray is automatically extended by the operator, pins are dropped into tray and the tray is retracted. Visual inspection is performed for protruding slider, unwound ribbons and incorrect grenades in each layer.

In the 12th layer, adapters are manually placed in the projectile, along with short sleeves, spacers and splines. Machine is activated to extend, press adapters to predetermined pressure, retract and release pallet.

Load gage station is a semi-automatic station used to insure meeting tight pack requirements. Operator actuates the station which puts a pre-determined pressure on cargo and provides a readout on the number of shims required. Ram is retracted and number of shims required are manually placed in the projectile.

Receive and inspect base plug. Receive and inspect base plug "O" ring. Assemble base plug and "O" ring. Receive "locktite" and place manually on base plug threads, then start base plug manually into the projectile.

Torque base plug and check torque. Torque station is fully automatic, which positions and locks pallet, extends torque head, torques base plug to predetermined torque, reverses, applies break-away torque, reverses again and applies full torque. Pallet is then released for transfer to next operation.

If base plug does not torque properly, or withstand break-away torque, the bay supervisor takes over the station. The pallet is released to Station 8, where a hoist is used to remove the projectile and place it on rework trailer pending further disposition.

Transfer to packout system. This operation is fully automatic to remove projectile from cross transfer system, transfer projectile to packout system and place projectile, base down, in packout pallet.

Packout Operation -

Zone weigh - This operation is fully automated to weigh and verify the weight of assembled projectile. The station engages the projectile, weighs it, gives a digital readout of the weight and disengages from the projectile. Weight is retained in a memory system and transferred to the stencil and zone stake station. Pallet is then released to next operation.

I. SYSTEM DESCRIPTION (Cont.)

Stencil - This is fully automated to stencil and zone stake projectile with a memory from previous station. The projectile is engaged, stenciled as to nomenclature. (Visual inspection of marking.)

Receive and Unpack Expulsion Charge Cups - Place cups manually on trays for usage at stake station.

Insert cups manually in projectile. Stake and gage cup depth.

The following three (3) expulsion charge loading operations are performed in Building 316 or Building 715, 700 Line:

Load propellant in bag - Operator places bag over spout below loader and activates switch, which drops correct amount of propellant into bag.

Seal bag - Bags are sealed by remote control after they are placed in heat seal unit and barricade door is closed. Leak test is required. Sealed bag is placed in a chamber of water and pressurized to appropriate amounts.

Packout bag - Bags are placed in proper containers after passing inspection and shipped to final assembly.

Receive and inspect propellant, place charge in cup, and start nose plug.

Torque and Detorque Check Nose Plug - This station is fully automatic station which positions and locks pallet, extends torque head, torques nose plug to a predetermined torque, reverses, applies break-away torque, reverses again and applies full torque. Pallet is then released for transfer to next operation (if nose plug will not stand break-away torque, a reject memory pin will be set cancelling all subsequent operations).

Leak Test - This station is a semi-automatic station which locks projectile in position. The air test chamber moves down over projectile, seals against the base of pallet. Chamber is pressurized to the required amount. Chamber is then depressurized and retracted from projectile. If acceptable, operator then releases pallet (if rejected, a reject memory pin will be set cancelling all subsequent operations).

Receive obturating band protector (grommet) and place manually on projectile following removal from packout system.

I. SYSTEM DESCRIPTION (cont)

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Palletize - This is a manually operated station to place projectile on pallets, receive lids, stencil lids manually, place lids on pallets. After lid is placed on pallet of projectiles, it is strapped and sealed. Straps are strapped to pallet manually.

When inspection of pallet is complete it is moved to shipping area for necessary paperwork for shipment to storage.

700 AREA: LOAD, ASSEMBLY, AND PACKOUT PROCESS

The 700 Line currently produces the M55 detonator, the M483 lead cup and the expulsion charge assembly. At the present time, 22 buildings are used in the manufacturing process. Of the 22 buildings, 14 have sump tanks located adjacent to them. Five of these 14 buildings are dry houses which only use their sumps once every six months.

Debarreling NOL-130

Dextrinated Lead Azide, Tetracene, Lead Styphnate, and Special Purpose Lead Azide are received in barrels at Bldg 702. These powders are then stored until transported to Bldg 740W where they are debarreled. Debarreling is a function which is accomplished one barrel at a time; the process of removing the powders from their shipping barrels and placing them in stainless steel vats. The powders are packaged in cloth bags which are located inside of a large non-conductive rubber bag within each barrel. This non-conductive rubber bag is surrounded by a mixture of sawdust, alcohol, and water, which acts as a cushion to help avoid an explosion. Once the powder is placed into a stainless steel vat, it is then transported back to Bldg 702 for storage.

Laying-Out of Powder

As the Dextrinated Lead Azide, Tetracene, Lead Styphnate, and Special Purpose Lead Azide are needed, they are transported from Bldg 702 to Bldg 740E, where the powder is layed out. Laying-out is the process of taking the powder out of its cloth bag, placing it in a vacuum to remove excess water and alcohol, and then placing the powder in a conductive rubber drying tube. After the laying-out operation, the powders are transported to their respective dry house.

Drying NOL-130 Powders

Each powder has a different dry house that it goes to except Dextrinated Lead Azide and Tetracene which is stored in the same dry house. Dextrinated Lead Azide goes to Bldg 738, Tetracene to Bldg 738, Lead Styphnate to Bldg 737, and Special Purpose Lead Azide to Bldg 704. These powders are left in their respective dry houses until they are dried and ready to be transported to the south end of Bldg 705 for screening.

Screening NOL-130 Powders

Screening is the process of removing foreign materials from the powders. In order for the powders to be processed properly, the lumps and foreign material has to be removed. After the screening is completed, the powders are once again transported back to their respective dry houses for storage.

Weighing NOL-130 Powders

The powders are next removed from their respective dry houses and transported to Bldg 705. This time, however, the powders are taken to the north side of Bldg 705 for weighing. Weighing of the powder is the process of measuring out a predetermined amount of powder into a premeasured pitcher. This procedure

applies to all powders except Special Purpose Lead Azide, which does not require weighing and is consequently taken to Bldg 705, where it is bowled.

Bowling, Special Purpose Lead Azide

Bowling of Special Purpose Lead Azide involves taking the powder out of the screening pitcher and placing it into a loading pitcher. This loading pitcher is used for placing the Special Purpose Lead Azide into the Jones Loader. After bowling is completed, Special Purpose Lead Azide is transported to Bldg 741 for storage until needed in Bldg 716. From the north end of Bldg 705 the powders are all transported back to Bldg 737. As needed, the powders, with the exception of Special Purpose Lead Azide, are taken from dry houses 737 and transported to the south end of Bldg 705 for blending.

Blending NOL-130 Primer Mix

Blending is done to Antimony Sulfide for five minutes. Then Barium Nitrate is added and blended for five minutes. Next Dextrinated Lead Azide is added and blended for five minutes. Then Tetracene is added and blended for five minutes. Next Lead Styphnate is added and blended for 20 minutes. This process formulates NOL-130 primer mix, which was developed by the Naval Ordnance Laboratory. Antimony Sulfide and Barium Nitrate are inert materials. The inert materials are introduced into the 700 Area at Bldg 734 where they are screened, weighed, and stored until being transported to Bldg 705 where they are blended. Once this primer mix is blended, it is transported to Bldg 727. Here the primer mix will remain until it is to be bowled.

Bowling NOL-130

Bowling is the process of placing a predetermined amount of primer mix into a small bowl. This is done at Bldg 732. After bowling, the primer mix is transported to Bldg 741. Bldg 741 functions as in-process storage. The powder is stored for a short time and then transported to Bldg 716 as production demands. Upon reaching Bldg 716, the primer mix along with lead azide and RDX is placed into the M55 detonator.

RDX Powder (Debarrel, Lay Out, Screen, and Blend)

RDX powder is received from the vendor at Bldg 709. Here the RDX is stored until it is transported to Bldg 729. Upon reaching Bldg 729, RDX is debarreled and layed out all at the same time. Once RDX is placed in drying tubes, it is transported to Bldg 707 where it is dried and stored. Leaving Bldg 707, RDX is moved to Bldg 712 where it is screened.

After RDX is screened, it is blended with Graphite. RDX is blended in 30 pound batches containing either 130 or 150 grams of graphite per batch. An RDX batch blended with 130 grams of graphite makes up the mixture for the M483 lead cup, and a batch containing 150 grams makes up the mixture for the M55 detonator. Once the blending is completed, the batches are transported to Bldg 701.

RDX (M55 Detonator)

At Bldg 701, the mixture of RDX with 150 grams is compressed into a RDX pellet which is used in the M55 detonator. Upon leaving Bldg 701, the RDX pellet is transported to Bldg 716 for loading into the Jones Loader.

RDX (M483 Lead Cup)

The RDX batch containing the 130 grams is swaged into the M483 lead cup. From Bldg 701 the lead cup is transported to the 300 Area at Kansas Army Ammunition Plant.

Jones Loader (M55 Detonator)

The Jones Loader is a machine that combines primer mix, Special Purpose Lead Azide, and the RDX pellet into the detonator. When the detonators come out of the loader, they are taken to Bldg 717 for test firing, where one detonator out of every 1,000 is test fired. Once the detonators have been test fired, they are transported to Bldg 721 for storage until they can be moved to Bldg 722 for painting.

Pack Out (M55 Detonator)

When the detonators are painted and dried at Bldg 722, they are transported to Bldg 723, where they are packaged for shipping. After packaging, the detonators are transported to Bldg 728, where they are shipped out.